University Of Alberta
0 0002 08904 30

QA
107
S42
1974
Lev.2
Tch.Gde
BK.2
Curr

uide
ook 2

RA
MATHEMATICS
LEARNING SYSTEM TEXT

Ex libris
universitatis
albertaensis

Canadian Publication

MATHEMATICS LEARNING SYSTEM

The Canadian publication of *Mathematics Learning System* is completely metric.

On some pages, major revisions have been made. In several cases the goal of the page has been altered, as indicated below:

Page 135 Purpose: Introduction of abbreviation *cm*.
Page 136 Purpose: Measuring with centimetres.
Page 137 Purpose: Measuring to the nearest centimetre.
Page 138 Purpose: Measuring to the nearest centimetre.
Page 139 Purpose: Measuring to the nearest centimetre.
Page 231 Purpose: Introduction of the litre.
Page 232 Purpose: Measuring in litres.
Page 233 Purpose: Introducing millilitres.

On the following pages, the answers are as given below:

Page 135
10, 7, 3, 5, 6 cm

Page 137
4, 2, 5, 6, 4, 6, 7 cm

Page 142

4, 4, 4, 12 cm	3, 3, 3, 3, 12 cm
3, 5, 4, 12 cm	3, 5, 3, 5, 16 cm

Page 144
Last question in first color block: 20 cm or 30 cm
Last question in second color block: 100 cm

Substantial revisions have also been made on pages 142, 143, 144 and 230, and minor ones on many other pages of the pupils' text, for Canadian use. These include a number of new illustrations, including all those of coins. However, they do not affect the teaching of the program.

On the pages listed below, although the answers in the Teacher's Guide are numerically correct for the questions in the pupils' textbook, questions have been changed to include only metric units:

Pages 136, 138, 139, 140 The answers are all in centimetres.
Page 169 The answer to the question bottom left is in steps, not miles.

Page 231

No	Yes
Yes	Yes or No acceptable
	No
	One litre

Page 232
Answers will vary

Page 233

225 ml	50 ml	350 ml
	500 ml	

Page 246
Question 6: 2 litres

Teacher's Guide
Level 2 Book 2

SRA MATHEMATICS LEARNING SYSTEM TEXT

M. Vere DeVault
Professor of Curriculum and Instruction
University of Wisconsin

Helen Frehmeyer
Classroom Teacher and
Educational Consultant

Herbert J. Greenberg
Chairman, Department of Mathematics
University of Denver

Stanley J. Bezuszka
Director
Boston College Mathematics Institute

SRA

SCIENCE RESEARCH ASSOCIATES, INC.
Chicago, Palo Alto, Toronto
Henley-on-Thames, Sydney, Paris

A Subsidiary of IBM

© 1974, Science Research Associates, Inc.
All rights reserved.

Printed in the United States of America

UNIVERSITY OF ALBERTA LIBRARY

CONTENTS

Book 1

chapter 1
addition and subtraction facts xiii

Notes and things xiv • Survey 1–2
The number line 3–8
Addition and the number line 9–12
Progress Check 13
The addition table 14, 25
Addition with sums 10 through 18 15–17
Progress Check 18
Word problems 19
Addition practice 20–22
Progress Check 23
Finding a missing addend 23
More addition practice 24–25
Readiness for subtraction 26–27
Subtraction and the number line 28–29
Subtracting from numbers less than 10 30–33
Subtracting from numbers 10 through 18 34–37
Progress Check 38
Word problems 39
Subtraction practice 40–41
Problem solving 42–48
Checkout 49–50
Resource Section 50a–d

chapter 2
number relations 50e

Notes and things 50f
Review of order of numbers 51
Greater-than and less-than symbols 52–55
Problem solving 56
Finding a missing addend 57–62
Problem solving 63
Checkout 64
Resource Section 64a–b

chapter 3
adding and subtracting multiples of 10 64c

Notes and things 64d
Place value for 2-digit numbers 65–72
Adding multiples of 10 73–75
Progress Check 75
Ordering and comparing numbers 76, 80
Place value for 3-digit numbers 77–79, 81
Adding multiples of 10 82–85
Progress Check 86
Subtracting multiples of 10 87–90
Progress Check 91
Checkout 92
Resource Section 92a–b

chapter 4
geometry 92c

Notes and things 92d • Survey 93
Exploring surfaces of:
cubes, cylinders, and spheres 94–95
cones 96
prisms 97
pyramids 98
Exploring surfaces, edges, and corners of solid geometric shapes 99–101
Checkout (in Teacher's Guide only) 101
Resource Section 101a–b

chapter 5
extending addition and subtraction skills 101c

Notes and things 101d • Survey 102
Adding a 2-digit and a 1-digit number, no renaming 103–105
Adding 2-digit numbers, no renaming 106
Problem solving 107
Subtracting a 1-digit number from a 2-digit number, no renaming 108–109
Subtracting a multiple of 10 from a 2-digit number 110
Progress Check 111
Introduction to multiples of 100 112
Adding two 3-digit multiples of 100 113–115
Problem solving 116–117
Place value for 3-digit numerals 118–120
Checkout 121
Problem solving 122
Adding three 1-digit addends 123–128
Progress Check 128
Resource Section 128a–e

other learning aids
bibliography

LIBRARY
UNIVERSITY OF ALBERTA

Book 2

chapter 6
measurement—length 128j

Notes and things 128k • Survey 129
Measuring with a unit of length 130–132
Measuring—
with a centimetre 133–134
with an inch 135
to the nearest unit 136–139
Progress Check 140
Measuring distances 141–143
Checkout 144
Resource Section 144a–b

chapter 7
extending subtraction skills 144c

Notes and things 144d • Survey 145
Review of subtraction facts 146–147
Subtracting a 1-digit number from a 2-digit number, no renaming 148–150
Subtracting 2-digit numbers, no renaming 151–155
Progress Check 156
Subtracting 2-digit numbers, no renaming 157–160
Readiness for subtraction with renaming 161
Checkout 162
Problem solving 163
Resource Section 163a–b

chapter 8
addition with renaming 163c

Notes and things 163d • Survey 164
Adding with renaming 165–166
Practice in adding 2-digit numbers with renaming 167–171
The short algorithm for addition with renaming 172–173
Progress Check 174
Adding three 2-digit numbers 175–178
Checkout 179
Resource Section 179a–b

chapter 9
money 179c

Notes and things 179d • Survey 180
Counting and comparing coins 181–183
Showing a dollar value with coins 184–186
Naming the value of a set of money 187
Writing dollar-and-cent notation 188–189
Solving special problems with money 190–192
Checkout (in Teacher's Guide only) 192
Resource Section 192a–b

chapter 10
subtraction with renaming 192c

Notes and things 192d • Survey 193
Review of subtraction facts 194–197
Subtracting 2-digit numbers, no renaming 198–199
Subtraction with renaming 200–207
Progress Check 208
Subtracting 2-digit numbers with renaming 209–214
A shorter form for renaming 215
Checkout 216
Resource Section 216a–b

chapter 11
fractions 216c

Notes and things 216d • Survey 217
Making models to solve word problems 218
Writing fractions 219–221
Comparing fractions 221
Checkout 222
Exploring addition of fractions 223
Exploring symmetry 224–227
Checkout 228
Making symmetrical shapes 229
Resource Section 229a–b

chapter 12
measurement 229c

Notes and things 229d
Survey—liquid measure 230
Relationship of capacity and shape 231
Comparing units of liquid measure 232–233
Survey—telling time 234
Telling time on the hour 235
Reading and recording the number of minutes after the hour 236–240
Reading and recording the number of minutes before the hour 241–244
Reading the calendar 245
Checkout 246
Resource Section 246a–b

chapter 13
review and extension 246c

Notes and things 246d
Adding 1- and 2-digit numbers 247
Adding 3-digit numbers, no renaming 248
Extension of addition skills, no renaming 249
Extension of subtraction skills 250
Addition and subtraction practice, no renaming 251
Readiness for multiplication 252–256
Resource Section 256a–h

other learning aids
bibliography

2468854

OBJECTIVES

Content objectives have been a part of instructional programs for years. Recently there has been an increased emphasis on being more specific about these objectives. Performance, instructional, educational, and behavioral objectives can be defined quite differently from one another, but there is little agreement as to a single definition for each kind. There is agreement about the purpose of objectives, however. This program was built upon learning objectives. Each objective clearly states what pupil behavior is to be observed, the conditions under which the pupil is to perform, and the criteria for acceptable performance.

These learning objectives by definition are limited to observable behavior; therefore they are automatically limited to the cognitive domain. This is a severe limitation, for the field-test information reveals that the affective domain also has been penetrated.

Increased pupil awareness of mathematics in the everyday world has been reported again and again. A greater pupil involvement in things relating to mathematics has been shown in the complete range of abilities. Attitudes have been changed. But writing objectives for the affective domain is a new endeavor, and frankly we have not yet mastered the art. The following, therefore, are learning objectives in the cognitive domain. Each objective states the performance expected at the completion of the second-level materials.

whole-number concepts

1. Given a set of from 0 to 999 members, the learner can count, say, and write the number of members in the set.
2. Given any two numbers from 0 to 999, the learner can compare the numbers by saying "more than," "less than," or "equal to" or by writing the symbols $>$, $<$, or $=$.
3. Given any two numbers less than 999, the learner can write or say the numbers in between.

whole-number notation

1. Given any one of the numerals 0, 1, 2, 3, . . ., 999, the learner can read it aloud; given any of these numerals orally, the learner can write it.
2. Given the number of hundreds, tens, and ones, the learner can write the corresponding numeral.

whole-number operations

1. Given any two 2-digit numbers, the learner can find their sum.
2. Given a subtraction number fact written in horizontal or vertical form, the learner can say and write the difference.
3. Given any two numbers from 0 to 99, the learner can find their difference.
4. Given any two numbers with a sum less than 100, the learner can show that the order in which the two numbers are added does not change their sum.
5. Given any three 2-digit numbers with a sum less than or equal to 100, the learner can find their sum.
6. Given any three numbers from 0 to 99 with a sum less than or equal to 100, the learner can show that the way the addends are grouped does not affect their sum.

fractional-number concepts

Given a region or a number strip divided into halves, fourths, or eighths, the learner can say and write the fraction associated with marked parts.

fractional-number notation

Given any of the fractions $\frac{1}{2}$, $\frac{1}{4}$, $\frac{2}{4}$, $\frac{3}{4}$, $\frac{1}{8}$, the learner can read it aloud; given any of these fractions orally, the learner can write it.

geometry concepts

Given objects such as boxes, cans, balls, and blocks, the learner can identify rectangular prisms, triangular prisms, cubes, and cylinders by sorting.

measurement

1. Given a standard unit of metric measure (centimetre) or customary measure (inch), the learner can find the number of whole units in the length of an object.
2. Given a clockface with hands showing the hour or half-hour, the learner can name the time.
3. Given a calendar and a specified date, the learner can locate that date on the calendar.
4. Given a dollar bill and a set of pennies, nickels, dimes, and quarters (not to exceed the value of one dollar), the learner can tell the value of the money.

6 MEASUREMENT - LENGTH

before this chapter the learner has —

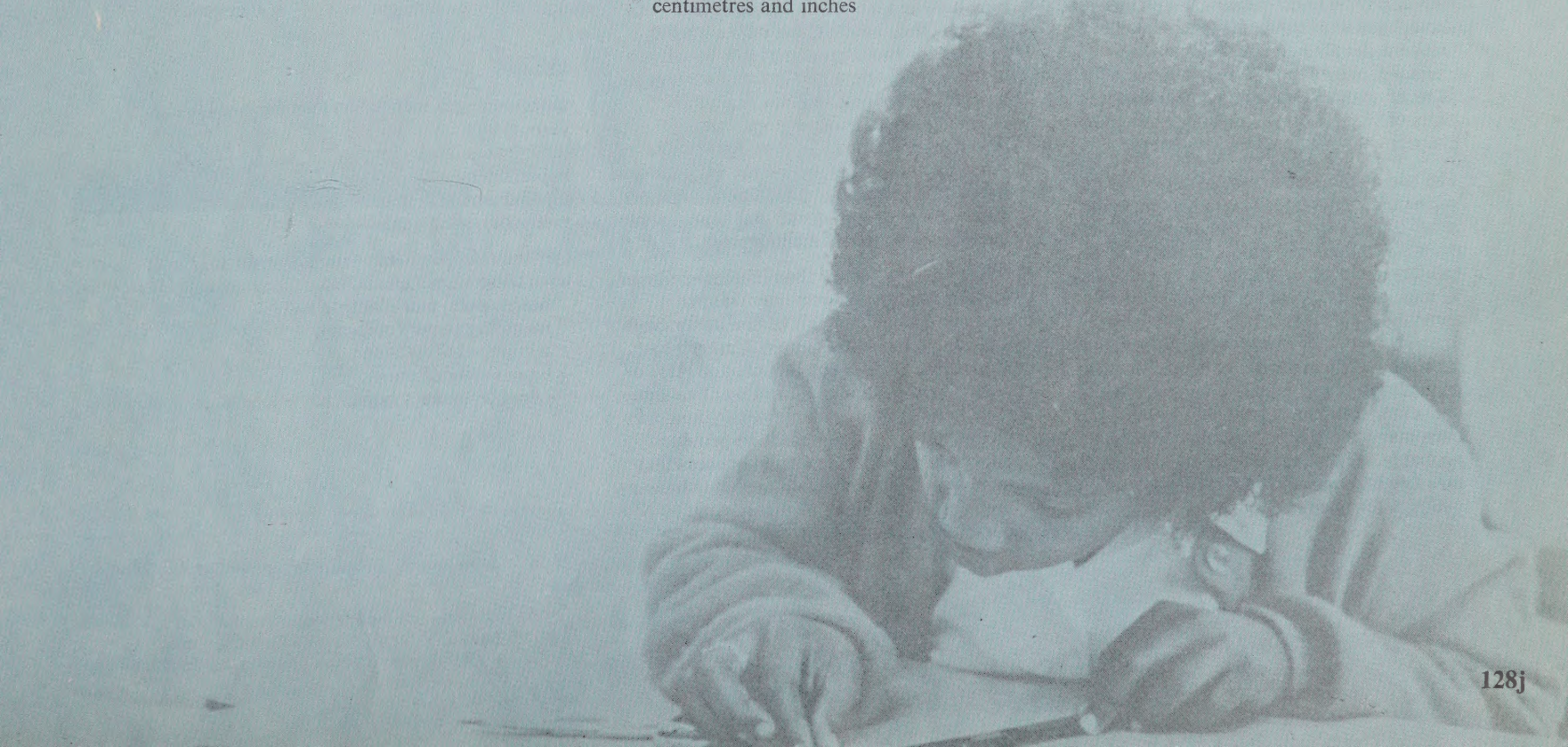
1. Compared two objects to find which is taller, longer, or shorter
2. Found two things that have the same length
3. Found about how many times a length is contained within a longer length

in chapter 6 the learner is —

1. Using rulers, metresticks, and yardsticks for measuring
2. Measuring the length of objects to the nearest centimetre and inch
3. Measuring the distance around plane figures and real objects with centimetres and inches

in later levels the learner will —

1. Measure objects to the half inch or millimetre
2. Measure objects to the nearest foot, yard, or metre
3. Select an appropriate unit of measure for measuring an object



Notes & Things

The first page of the chapter tells the whole story with one simple question, "How long?" When we measure we make a comparison, and that's what the youngsters will be doing. They will start comparing lengths of objects with nonstandard units of measure, and soon everyone will agree that using just any old thing to measure with can be very confusing. The youngsters should not find it difficult to accept the fact that people agreed long ago that *standard units of length* had to be used to prevent misunderstandings. Two standard units of length will be introduced in this chapter—the *inch* and the *centimetre*.

The use of the metric system is not now as widespread in North America as in most areas of the world, but it is being used. For example, all measurements in the U.S. military are metric. Medicines are measured in metric units. Consider the number of sporting events (especially the Olympic Games) and all the photographic equipment that use metric measure. A careful look at canned goods will reveal a surprise—more and more companies are using both customary and metric measure. Metric will probably become the official system of measure throughout North America within a few years.

The introduction of the metric system provides an excellent opportunity for a social studies lesson. Because of increased international trade and travel, a uniform system of measures has become a necessity. As a result, many countries of the world have made certain agreements that will help everyone communicate and trade. They now use the same units of measure. Further, they have agreed on a uniform spelling for those units that can be written in more than one way. Concessions had to be made. The International Standards Organization, which developed the International Metric System, agreed, for example, that *metre* will be the international spelling of this particular word. This was a trade-off for dropping the *-me* from *gramme* for the international spelling *gram*.

If you need to justify the different spellings to your youngsters, you may want to examine names that can be spelled in more than one way—for example, Catherine or Katherine, Dwayne or Duane, and Ann or Anne. You certainly will not want to study the metric system in depth with youngsters at this level. Our purpose is to provide background to develop an awareness that *everyone* in the world will probably have a few words (and units of measure) in common someday soon.

words

Concept-development words introduced in the chapter are listed in the order in which they are used orally. Those words that also appear on pupil pages are marked with an *.

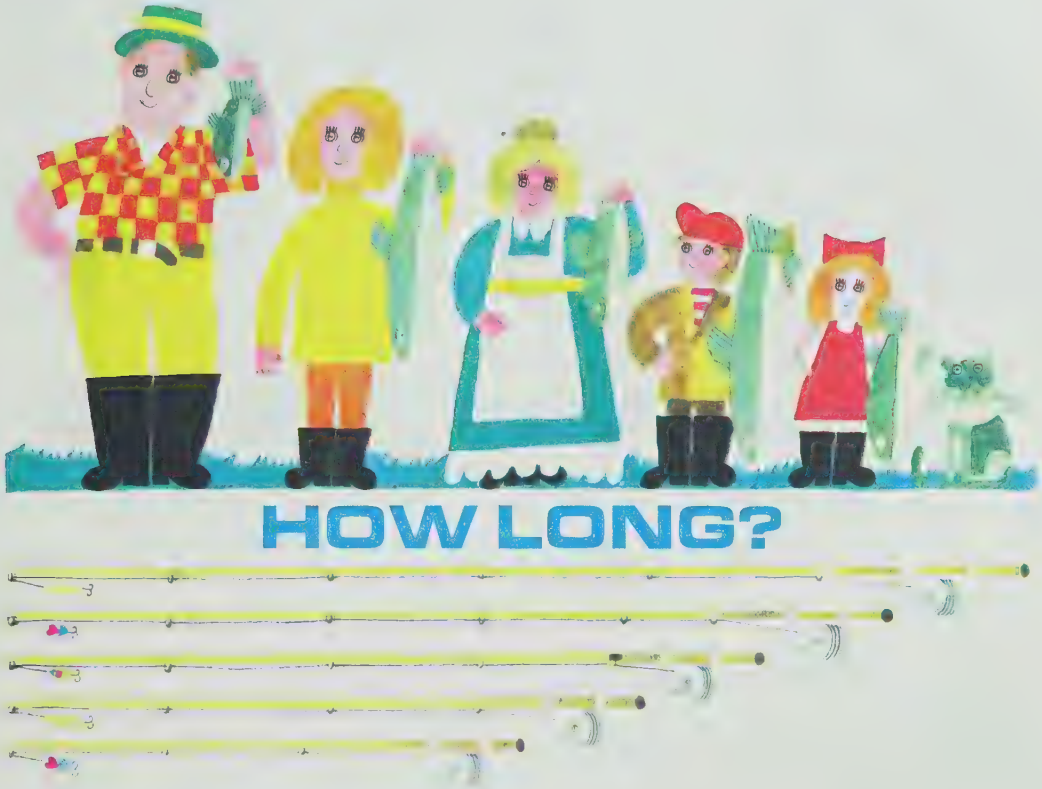
measure*	centimetre*	inch*
length*	tall	yardstick*
unit*	height	metrestick*

things

centimetre and inch rulers (See page 144 b)
yarn, string
cans, boxes, milk cartons
paper rulers
tape measure
metresticks and yardsticks

For the extra activities you will want to have these things available:
- beans, pots, and planting soil
- wrapping paper (optional)
- adding-machine tape
- large sheets of paper
- paper to make a book

name _____



© 1974, SRA PURPOSE: Introduction to length measurement

things beans for planting, several pots, planting soil

Plant the seeds now so that the plants will break ground in a week or so. You'll need the plants for the activity on page 140.

Keep everyone wondering about what will be done with the plants.

lesson Page 129

goal **Survey**—knowledge of length measurement

page 129 Talk about the people in the picture and what they have been doing. *Have any of you ever gone fishing? What is it like? What equipment do you need? What makes a fisherman happy?*

Read the question under the picture. *Who's holding the longest fish? Which fishing pole is the longest? How long is the girl's fish? How can you really find out?*

Do the children use the words MEASURE or LENGTH? If not, introduce these words now. *How* **long** *is the* **shortest** *fishing pole? How can you really find out? What could we use to measure a fishing pole? Have you ever been measured for anything?* (Shoes, length of pants, height)

Show me the longest thing in your desk. How do you know it is the longest?

If you wish, the children can mark the longest fish, pole, person, or dress.

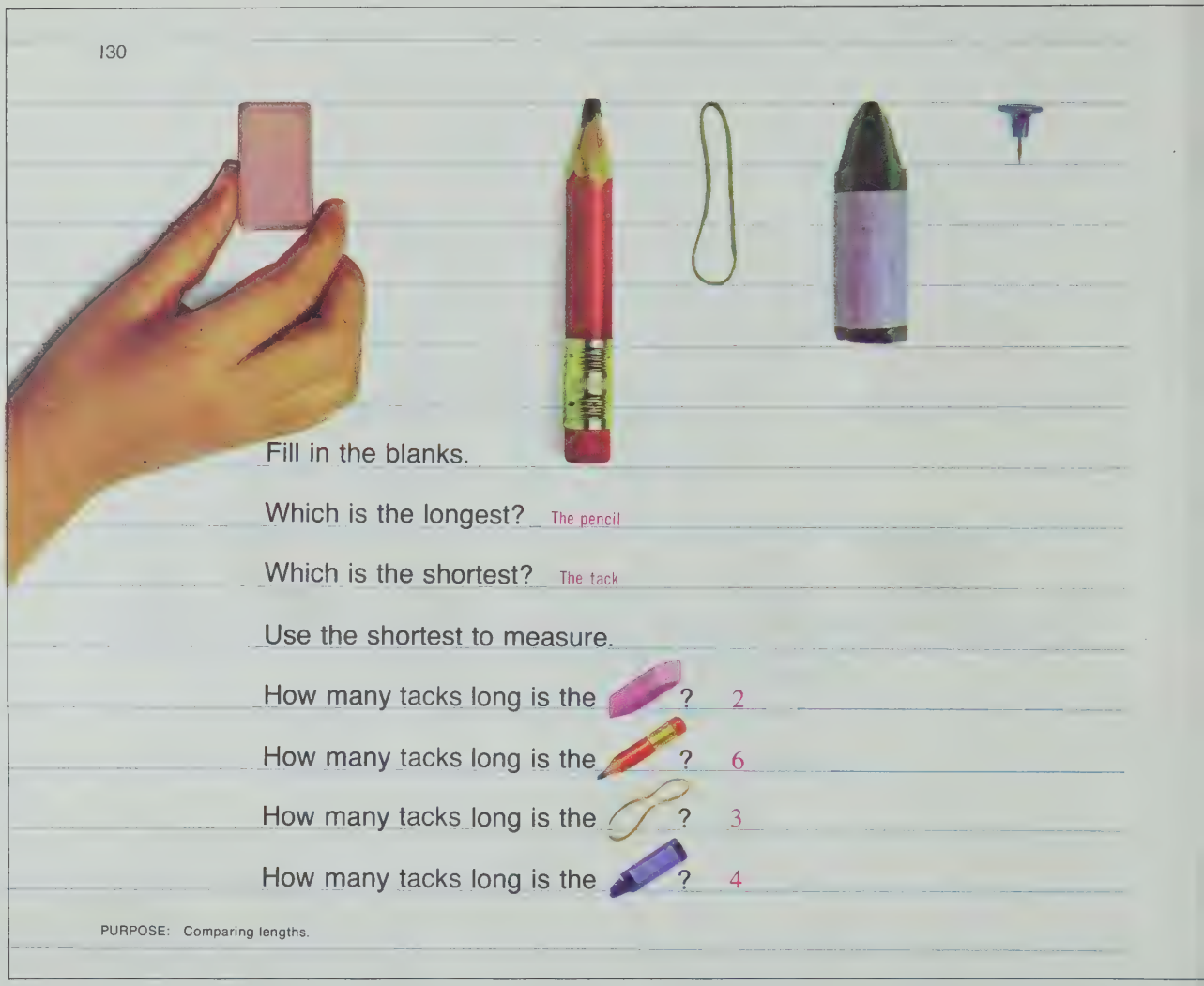
lesson Pages 130, 131

goal Development of measuring with a unit of length

warm-up Use an eraser to measure the length of the chalkboard. Get the measuring started so that the youngsters are continually reminded that one end of the eraser must touch the last mark made and that a new mark is made at the other end of the eraser each time. *How many erasers long is the chalkboard?*

Use a similar method to measure other objects that can be moved—a book or pointer, for example. Put the book in a horizontal position. Get agreement about how long it is. Rotate the book so that the dimension that was measured is now vertical. Does everyone agree that its measure is still the same? Don't be surprised if you have to measure again to prove it. This warm-up is especially important for this page because each of the objects pictured on the page is in a vertical position. Interchanging the words **height** and **length** at this point will bring only confusion.

page 130 Talk about the objects on the page. *What was used to measure the space between two blue lines?* (The length of the tack) Work on answering the questions as a group.

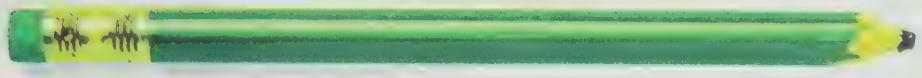

130
Fill in the blanks.
Which is the longest? The pencil
Which is the shortest? The tack
Use the shortest to measure.
How many tacks long is the ? 2
How many tacks long is the ? 6
How many tacks long is the ? 3
How many tacks long is the ? 4
PURPOSE: Comparing lengths.

name _____

Cut out the strip on the side of the page.
Use the strip to help you answer the questions.

How many strips long? 1

How many strips long? 2



How many strips long? 4

How many strips long
is this page? About 6

© 1974, SRA PURPOSE: Measuring lengths.

goal Development of measuring with a unit of length

memo You will have to watch everyone at the same time for this activity. Beginning experiences with measurement almost always reveal the measuring device lifted off the paper and simply put down again any old place.

Have patience.

warm-up Find out how many shoes long the room is. (The shoes are left on the feet, of course.) As the children measure, you will remind them that they must touch the heel of the right shoe to the toe of the left shoe because the job is to find out how many shoes long the distance is. We just can't have a bunch of space in between, for goodness sake.

things scissors

page 131 Follow the directions given on the page. Warn everyone to be very careful when cutting out the UNIT strip so that it will be a good measuring tool.

Direct the children to make a mark at the end of the strip each time they measure so that they can count the unit lengths when they finish. It will help them check their work too. Let them work independently. Compare the results. *Is the 1-unit strip a good measuring tool?*

lesson Page 132

goal Introduction to standard units of measure

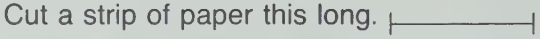
things scissors

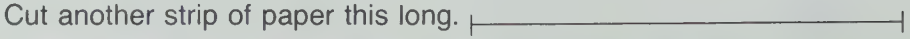
warm-up Trace around a math book on the chalkboard. *If I want to find out how long this book is, what should I measure?* Let a child show the length on the chalkboard. *What is another word for long?* (Length)

Could we measure the length of your arm? How? Could we measure the length of your foot? How?

page 132 The directions are all on the page. Again, warn everyone to be careful in measuring and cutting the strips of paper. Work the page together. *Which strip was the better measuring tool, the short one or the long one? Why?*

Have you heard the word **unit** *used in another place?* (Number-line activities) *How was it used? Do those unit strips at the bottom of the page look something like a number line? Have you ever seen anything else that looks something like those strips?* If no one mentions a ruler, don't push. Suggest that they keep their eyes and ears open. Maybe they will see something like those unit lengths. Rig the situation. Have a few rulers around the classroom by tomorrow. Maybe you'll find a first-rate detective in your group.

Cut a strip of paper this long. 

Cut another strip of paper this long. 

Use the strips to measure.

MEASURE	How many short strips?	How many long strips?
Length of this page	7	2
Width of this page	9	3
Length of your desk	Answers will vary.	Answers should be $\frac{1}{3}$ of the answers given in the first column.
Width of your desk	Answers will vary.	Answers should be $\frac{1}{3}$ of the answers given in the first column.
Length of your pencil	Answers will vary.	Answers should be $\frac{1}{3}$ of the answers given in the first column.

How many short strips to measure one long strip? 3

Call this strip a unit.

How many units in this? 5

How many units in this? 4

How many units in this? 2

PURPOSE: Measuring lengths—introduction to standard units of measurement.

133

name _____

People have agreed to use a unit of length called a centimetre.

This length is one centimetre.

This is 2 centimetres long.

This is 3 centimetres long.

How many centimetres long?

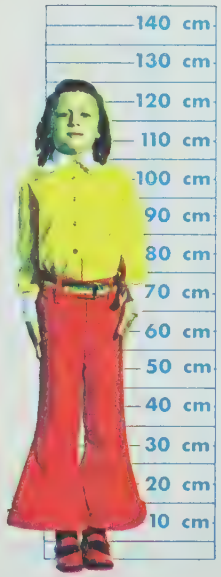
8 centimetres

6 centimetres

10 centimetres

5 centimetres

15 centimetres



© 1974, SRA PURPOSE: Introduction to the centimetre.

lesson Pages 133, 134

goal Introduction to measuring with a CENTIMETRE

memo Because **centimetre** is such a long word the symbol **cm** is introduced in the art, thus you can use it at any time. (It's also needed because nearly all centimetre rulers are marked with the symbol rather than the full word.) The symbol is introduced on page 137.

After the warm-up, study the picture. *Do you suppose you are as tall as the girl in the picture?* Promise that they will find out soon.

warm-up Direct three children of different heights to stand against the chalkboard. Make a mark on the board over the top of each head. *What do these marks show?* If the children do not use the word TALL or HEIGHT, introduce these words now.

page 133 Talk about the top of the page together. Point out the need for a standard unit of measure that everyone agrees on in order to communicate. *If you wrote grandmother a letter and said you are now 12 erasers tall, would she know how tall you are? What do you think the* **cm** *means?* Everyone knows or can find out the length of a centimetre.

Have the children answer the question independently. Check for understanding of **how** to measure by having the children illustrate **how** they got their answers. What did they count? If they counted each of the slash marks rather than the length of each unit, there is **big trouble!**

goal Practice in measuring with a centimetre ruler

things scissors
objects to measure

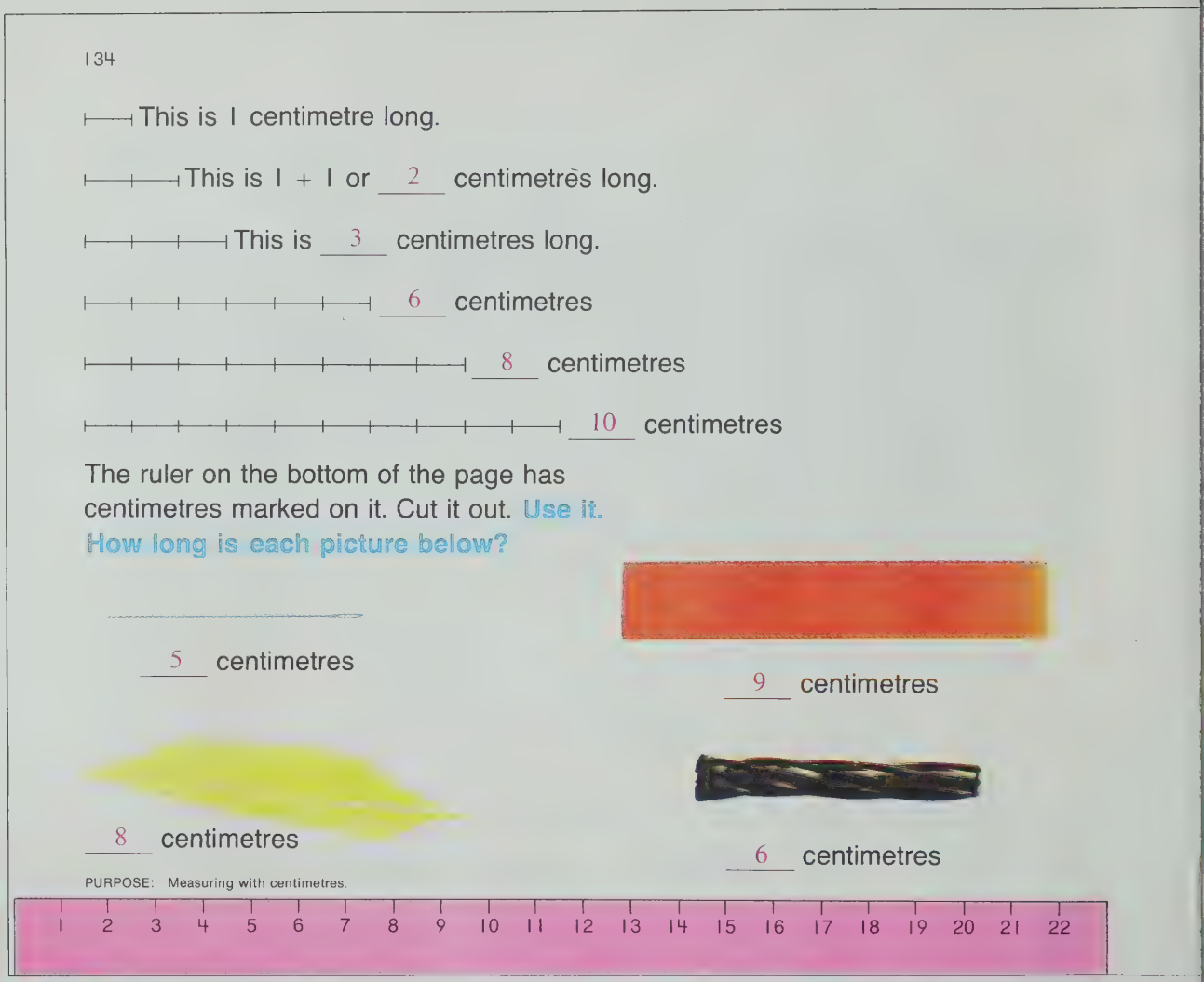
memo The development of measuring skills is carefully controlled. The objects to be measured are an exact number of centimetres long.

page 134 Work the top of the page together. Then have the children carefully cut out the centimetre ruler at the bottom of the page.

Talk about how to use a ruler. *Where does the ruler begin?* (At 0) *How do you know?* Distribute the objects to be measured. Ask how long each object is. Let several youngsters measure the same object. *Is the measure always the same?*

When **how** to measure with the ruler is clearly understood, the children are ready to complete the page. Disagree with one or two of their answers so that they must show you they know how to measure with their rulers.

The children should save their centimetre rulers for further use through page 144.


134
This is 1 centimetre long.
This is 1 + 1 or 2 centimetres long.
This is 3 centimetres long.
6 centimetres
8 centimetres
10 centimetres
The ruler on the bottom of the page has centimetres marked on it. Cut it out. Use it.
How long is each picture below?
5 centimetres
9 centimetres
8 centimetres
6 centimetres
PURPOSE: Measuring with centimetres.
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22

things yarn, string, adding-machine tape, or wrapping paper

Use yarn, string, or adding-machine tape and cut a length for each child that is as long as the child is tall. Another technique is to have the child lie down on wrapping paper and mark his height. Have the youngsters use their centimetre rulers to find their individual heights. Are they as tall as or taller than the girl in the picture on page 133?

name _____

Some people use another unit of length.
It is an inch. This length is one inch. ⊢——⊣

⊢——⊣ This is 1 inch long.

⊢——⊣——⊣ This is 1 + 1 or 2 inches long.

⊢——⊣——⊣——⊣ 3 inches

⊢——⊣——⊣——⊣——⊣ 4 inches

Cut out the inch ruler on the bottom. **Use it.**
How long is each picture below?

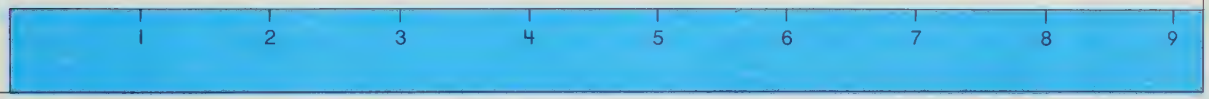
7 inches

1 inches

3 inches

2 inches

© 1974, SRA PURPOSE: Introduction to the inch.



Research project: *How many measuring tools can you find in school marked with centimetres? marked with inches?* The rulers from pages 134 and 135 can be used for checking. The pupils might also look at home. Build a classroom display with their findings.

lesson Page 135

goal Introduction to measuring with an INCH

memo The objects used for practice in measuring should be an exact number of inches long if possible.

things scissors
objects to measure

page 135 Talk about the top of the page. *Does an inch look longer or shorter than a centimetre?* The ruler has to be cut carefully again. Have the youngsters measure some objects as they did with the centimetre ruler.

When the objects on the page have been measured ask what important things must be remembered when measuring. *Is a ruler like a number line? How?*

Everyone should save his ruler for further use through page 144.

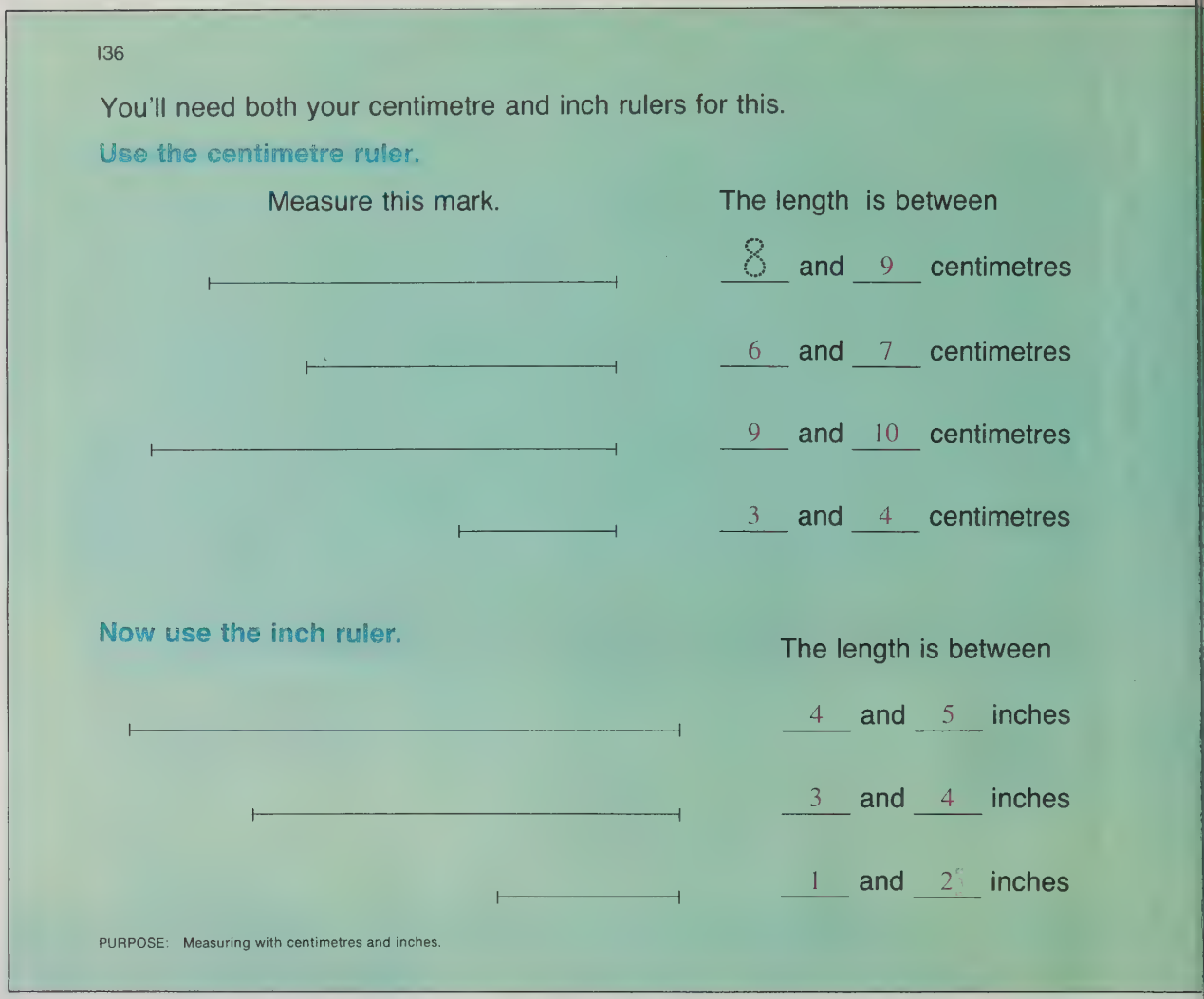
lesson Pages 136, 137

goal Introduction to measures between two units of measure

things for each pupil:
centimetre ruler
inch ruler

warm-up *What are the two units of measure we've studied?* Has anyone asked why we have both? *Measure one of your crayons with the centimetre ruler. Does your crayon end right at a number or does it end somewhere between two numbers? Between what two numbers does it end? Now measure your pencil.* Ask the same questions. Switch to the inch ruler and have the children measure their pencils again and then other items they have in their desks.

page 136 Read the directions together and fill in the blanks for the first sentence. When directions are clear, everyone is on his own. Watch for those youngsters who need more guidance in how to measure or in how to read a ruler.


136
You'll need both your centimetre and inch rulers for this.
Use the centimetre ruler.
Measure this mark.
The length is between
8 and 9 centimetres
6 and 7 centimetres
9 and 10 centimetres
3 and 4 centimetres
Now use the inch ruler.
The length is between
4 and 5 inches
3 and 4 inches
1 and 2 inches
PURPOSE: Measuring with centimetres and inches.

name _____

Ring your answers.

This is one centimetre long.

This is one inch long.

Which is longer—

1 centimetre or (1 inch?)

This is two centimetres long.

This is one inch long.

Which is longer—

2 centimetres or (1 inch?)

This is three centimetres long.

This is one inch long.

Which is longer—

(3 centimetres) or 1 inch?

Centimetre is a long word to write.
People have agreed to write **cm** when they want to shorten the word.

This is 5 cm long.
Is this nearer to (4 cm) or to 5 cm?

This is 2 inches long.
Is this nearer to (1 inch) or 2 inches?

You can say, "The length is about 1 inch long."

© 1974, SRA PURPOSE: Measuring to the nearest centimetre or inch.

goal Comparison of two lengths; measuring to the nearest unit of measure

things for each pupil:
centimetre ruler
inch ruler

warm-up *Measure the length of your math book with the centimetre ruler. Does your book end right at a number? Does it end between two numbers? Which number is it nearer?* Is the word **nearer** understood? Measure the height of the book. Switch to the inch ruler and repeat the activity. Measure a variety of objects with both rulers. How often is an object exactly a given number of centimetres or inches?

page 137 Four important ideas are presented on this page—

- Comparing two lengths
- Finding that an inch is between 2 and 3 centimetres long
- Introducing **cm** as the agreed-upon symbol for centimetre
- Deciding which measure a length is nearer to

Nice and easy. Take one idea at a time.

lesson Pages 138, 139, 140

goal Practice in measuring to the nearest centimetre or inch

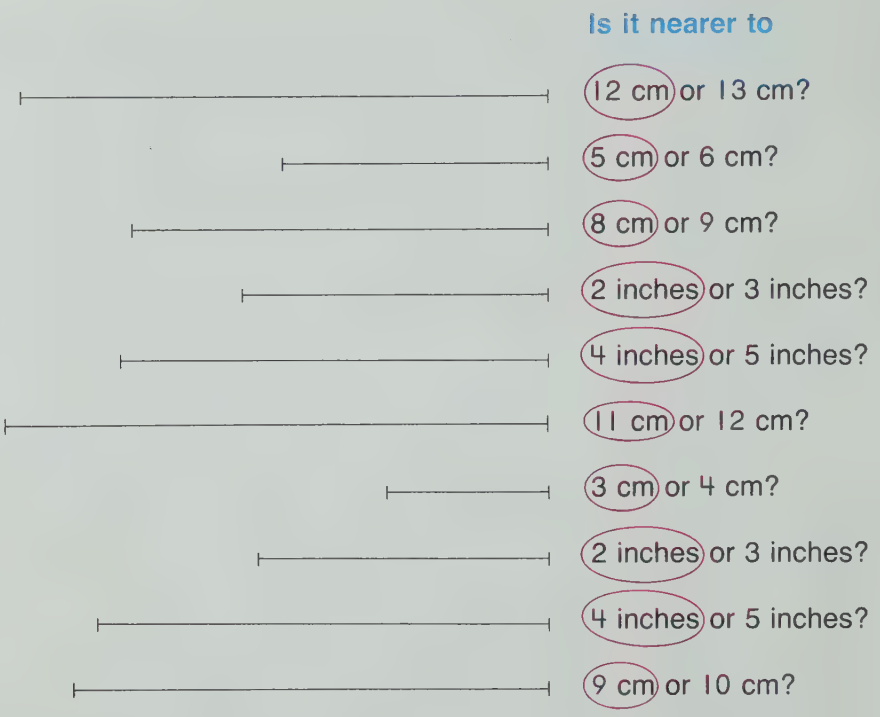
things for each pupil:
centimetre ruler
inch ruler

page 138 Make sure everyone knows one ruler from the other and which ruler to use for each problem. Do one or two problems together to get the children started on the right track. Disagree with some of their answers. Measure again to settle the argument.

138

You will need your centimetre and inch rulers for this.

Which measurement is nearer? Ring the right answer.


Is it nearer to
12 cm or 13 cm?
5 cm or 6 cm?
8 cm or 9 cm?
2 inches or 3 inches?
4 inches or 5 inches?
11 cm or 12 cm?
3 cm or 4 cm?
2 inches or 3 inches?
4 inches or 5 inches?
9 cm or 10 cm?

PURPOSE: Measuring to the nearest centimetre or inch.

Measuring practice is important. Let your pupils name objects in the room (school and home too) that could be measured. Emphasize length, width, or height. List these objects and have the list copied so that the measurements can be recorded as they are made. Compare results. Measure again to settle disputes.

name _____

Use your rulers.
Ring the measurement that is nearer.

Is it nearer to

3 inches or 4 inches?

5 cm or 6 cm?

8 cm or 9 cm?

2 inches or 3 inches?

4 inches or 5 inches?

Measure to the nearest centimetre.

3 cm

5 cm

7 cm

8 cm

© 1974, SRA PURPOSE: Measuring to the nearest centimetre or inch.

goal Practice in measuring to the nearest centimetre or inch

memo Once again, a photograph is carrying the burden of showing how "store-bought" centimetre rulers might look. The fractional part of a centimetre on an actual centimetre ruler can confuse a child. If you have no commercially prepared rulers in your room, forget any discussion referring to the ruler. But if you do have some around, let the photograph provide the setting for introducing them to the children.

things for each pupil:
centimetre ruler
inch ruler

page 139 Measuring to the nearest unit should be a familiar activity. *What will you do with this page?* When checking, any disagreements should be settled by measuring again.

things manila paper, rulers

Today you are an artist—an artist who makes pictures with only straight lines. That should cause some discussion. Rulers will help keep the lines straight. *When your picture is finished, measure each line in centimetres or inches. Write down the length of your longest line.*

Compare pictures and lengths of the longest lines. The youngsters may want to color and display their pictures.

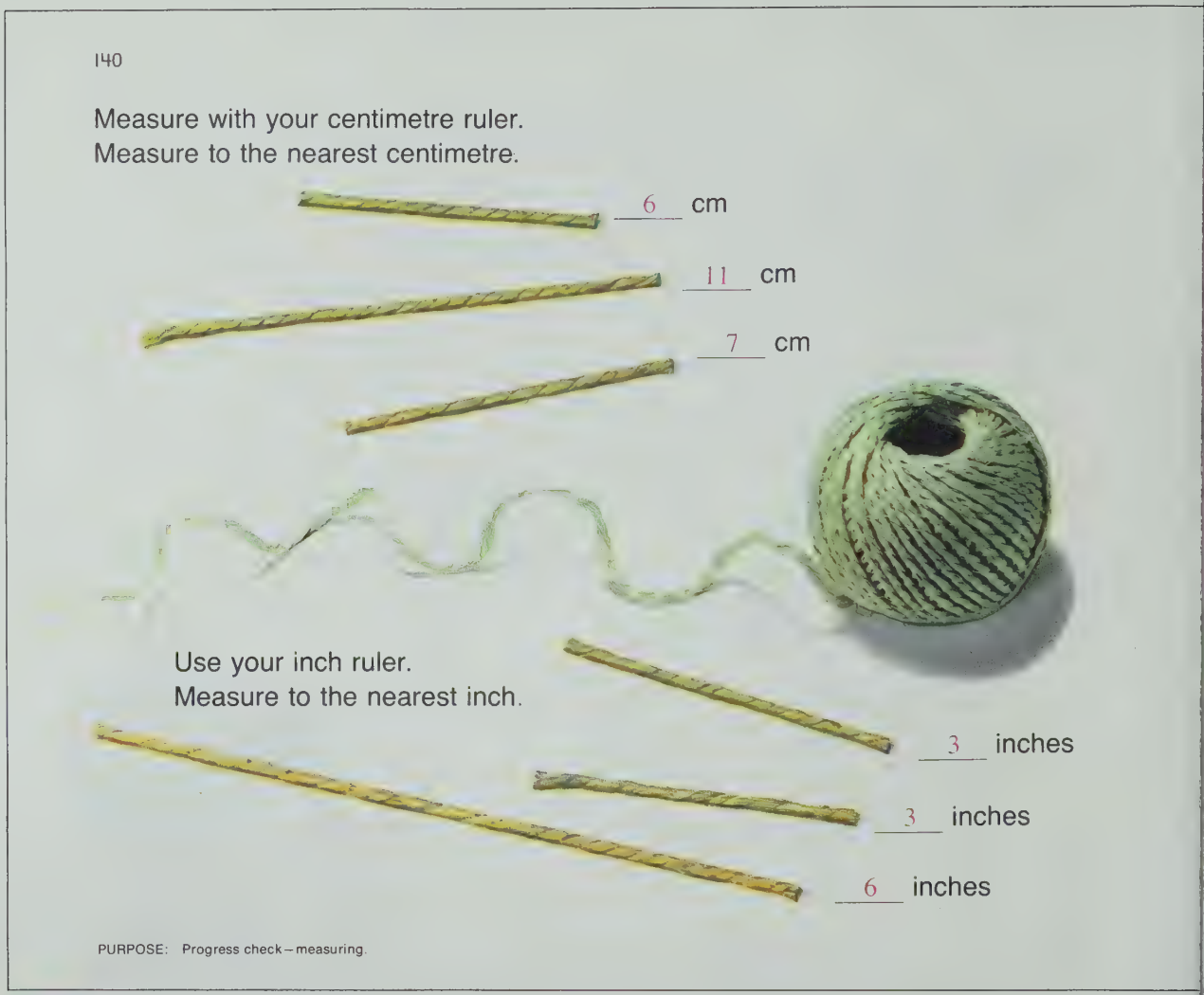
goal **Progress Check**—measuring to the nearest centimetre or inch

things for each pupil:
centimetre ruler
inch ruler

page 140 No choice of measures is given the pupils. They must measure and decide on their own. Check any errors carefully:

- Does the pupil have the correct answer for the wrong ruler?
- Did the pupil consistently round down (or up) rather than decide which measure was nearest?

Observe the pupils while they remeasure to be sure they know how to handle a ruler.

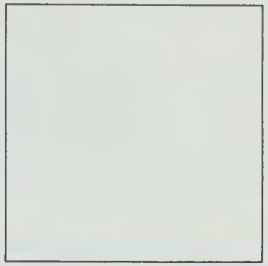


things bean plants from activity on page 129, centimetre and inch rulers

Assign a group of pupils to each bean plant. Some pupils will measure their plant in inches, some in centimetres. The plants should be measured each day and the growth recorded—to the nearest whole unit. You may want to have the youngsters record the growth on a graph. This activity should continue for about 2 weeks. It may become necessary to switch to metresticks and yardsticks.

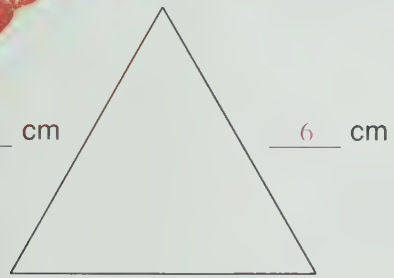
name _____

Sam had a problem. He was supposed to put red trim on each side of this square.



He used his cm ruler. He measured one side. He decided the square was 5 cm. He cut 5 cm of trim. That wasn't enough for all sides! How much trim did he really need? 20 cm

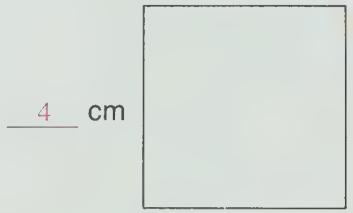
Measure each of the sides. Then find the distance around.



6 cm 6 cm

6 cm

18 cm around



4 cm

4 cm 4 cm

4 cm

16 cm around

© 1974, SRA PURPOSE: Introduction to distance as a length.

STOP Have pupils who are making errors measure with you so that you can see what is causing the trouble.

lesson Pages 141, 142, 143

goal Introduction to measuring the distance around a plane figure

things 5-cm pieces of yarn
20-cm pieces of yarn

page 141 Present Sam's problem to the group: Show a 5-cm piece of yarn to illustrate how badly Sam goofed. *Will this piece of trim go all the way around the square? How far will it go?* Challenge everyone to find how much trim Sam really needed. This is a real problem-solving session. How many methods did the children use to find the distance around the square? Take time for explanations and illustrations. Let them finish the page independently. Identify the youngsters who need additional help. Go right on to page 142.

goal Practice in measuring the distance around a plane figure

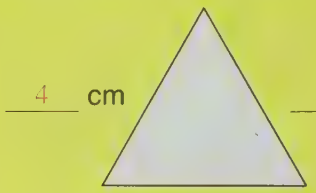
page 142 Pupils who were successful in measuring on the preceding page should go on independently while you work with the others.

When pages 141 and 142 are completed, talk about how many measurements are needed to find the distance around a square, a triangle, and a rectangle. On the board draw a triangle whose sides do not all have the same measure. *How many measurements are needed to find the distance around this triangle? Why?*

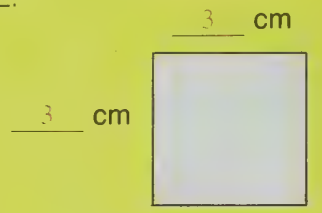
142

Measure each of the sides. Then find the distance around.

USE THE CENTIMETRE MEASURE.

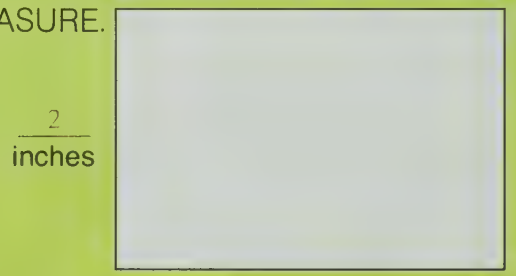


12 cm around



12 cm around

USE THE INCH MEASURE.



10 inches around

PURPOSE: Practice in measuring around 2-D shapes.

name _____

You can measure things that are not flat too.

Get some string. Put the string around the object you want to measure. Mark where the ends of the string meet. Lay the string down and measure its length with a ruler.

Use string and your ruler to measure the distance around each of these objects. Write the nearest number of units. Answers will vary.

A Can		cm or		inches
A Box		cm or		inches
Your Ankle		cm or		inches
Your Head		cm or		inches
Milk Carton		cm or		inches

© 1974, SRA

PURPOSE: Measuring length around objects.

goal Practice in measuring the distance around objects

things string
cans, boxes, milk cartons
paper rulers
tape measure

page 143 Develop the technique for measuring objects with a piece of string. Everyone needs a little experience. Lay the piece of string next to the appropriate ruler to find the number of inches or centimetres. When the method is understood, the children should do their own measuring to complete the page.

Compare results. *Was it easy to measure your ankle? your head? Measure them again. . . . Is your answer the same? What could cause the difference?* Pair the pupils. Let them measure one another's heads. *Did you find a different answer? Why?* This is an appropriate time to introduce a tape measure if you like. *Does this tool make measuring around things easier? How?*

Do you think the girl in the picture is using a tape marked with centimetres or inches to measure her ankle? Is she using a tape marked with centimetres to measure her head? Why do you think so? Hope that the youngsters will compare the measurements in the photo to their own measurements.

things large pieces of paper, centimetre and inch rulers

Have the pupils divide their papers into 6 same-size parts. Write directions for each part on the chalkboard. Example of directions are:

- Make an ice-cream cone 7 centimetres tall.
- Make a snake 4 inches long.
- Draw 2 stickmen 3 inches tall.

Making drawings of a specific length is a different skill from measuring a completed object. Don't expect perfection.

lesson Page 144

goal **Checkout**—measuring to the nearest centimetre or inch

memo This is really the first opportunity to introduce metresticks or yardsticks, and neither may be available to you. Do try to borrow some if you don't have any. If you don't have the sticks, you'll have to adjust for the questions on the page.

things rulers (See page 144b.)
metresticks
yardsticks

warm-up Have the children gather as many measuring tools as they can find. Everyone will want to try measuring with these devices. *Is measuring with a commercially made ruler any different from measuring with your paper ruler? How?*

page 144 Talk about the top of the page. Examine the 12-inch rulers the children found. Are both inches and centimetres shown? Introduce the names YARDSTICK and METRESTICK. Make sure everyone knows what units each tool measures.

There may be some problem with sharing the tools. If so, spread the activity over several days.

Watch the children as they measure. Knowing **how** to measure is important in obtaining a good answer. Discuss the results. When answers vary, have the objects measured again.

144

There are two rulers you can find.
One is about 12 inches or 30 cm long.
It is always called a ruler.

Another is about 36 inches or 100 cm long. If it is marked with inches and is 36 inches long, it is called a yardstick. If it is marked with cm, it is called a metrestick.

FIND A RULER.

How long is your reading book? _____*_____

How long is your middle finger? _____*_____

How long is a chalkboard eraser? _____*_____

How long is your pencil? _____*_____

How long is the ruler? 12 inches

FIND A YARDSTICK OR A METRESTICK.

How tall is your desk? _____*_____

How wide is the table? _____*_____

How long is your arm? _____*_____

How tall is the wastebasket? _____*_____

How long is the stick? 36 inches or 100 cm *Answers will vary.

PURPOSE: Checkout—standard measuring devices.

See activity 1, page 144a.

See activity 2, page 144a.

RESOURCES

another form of evaluation

for progress check – page 140

Use lengths of string or strips of paper. Have the pupil measure each one with his centimetre ruler and tell you its length.

for checkout – page 144

Use a ruler.

How long is your math book? ___
How long is your little finger? ___
How long is your shoe? ___
How long is your red crayon? ___

Answers will vary.

Use a yardstick or a metrestick.

How wide is the doorway? ___
How tall is your teacher's desk? ___
How wide is the bookshelf? ___
How tall is the wastebasket? ___

Answers will vary.

activities

1. things paper to make a book, yarn, rulers, metrestick, yardstick

Help each youngster form a "Measure Me Book." Include such measurements as height, length of arm, length of hand, distance around head, distance around wrist, length of leg, and any others the youngsters can think of. Substitute drawings for words if spelling is a problem. Pupils will have to work in pairs to get the actual measuring job done. Give each person the option to use centimetres or inches.

2. things centimetre and inch rulers, metresticks, yardsticks

Provide the group with a list of measurements and sufficient space to draw the object found. *Can you find something in the room that is about 4 centimetres long and 2 centimetres wide? 18 inches tall?* The measurements listed will have to be appropriate for objects found in your classroom.

additional learning aids

concept—chapter objectives 1, 2, and 3

SRA products

Mathematics Involvement Program, SRA (1971)
Cards: 182, 192, 202, 193, 223, 283, 303
Skill through Patterns, level 2, SRA (1974)
Spirit masters: 22, 44

other learning aids (described on page 256i)—Trundle Wheel, Willbrook Discovery Math Work Cards

letter to parents

Dear Parents:

We are going back to subtraction, so get ready to see your youngster's skills expand. We will be very carefully controlling the kinds of problems we work with.

For now we will be trying to structure a way to think about getting a problem done. We will start with handling objects so that the action of subtraction can be reviewed; subtraction problems then should make sense. This is the model that your child will see again and again.

tens	ones
2	7 to start with
−	4 taken away
	remain

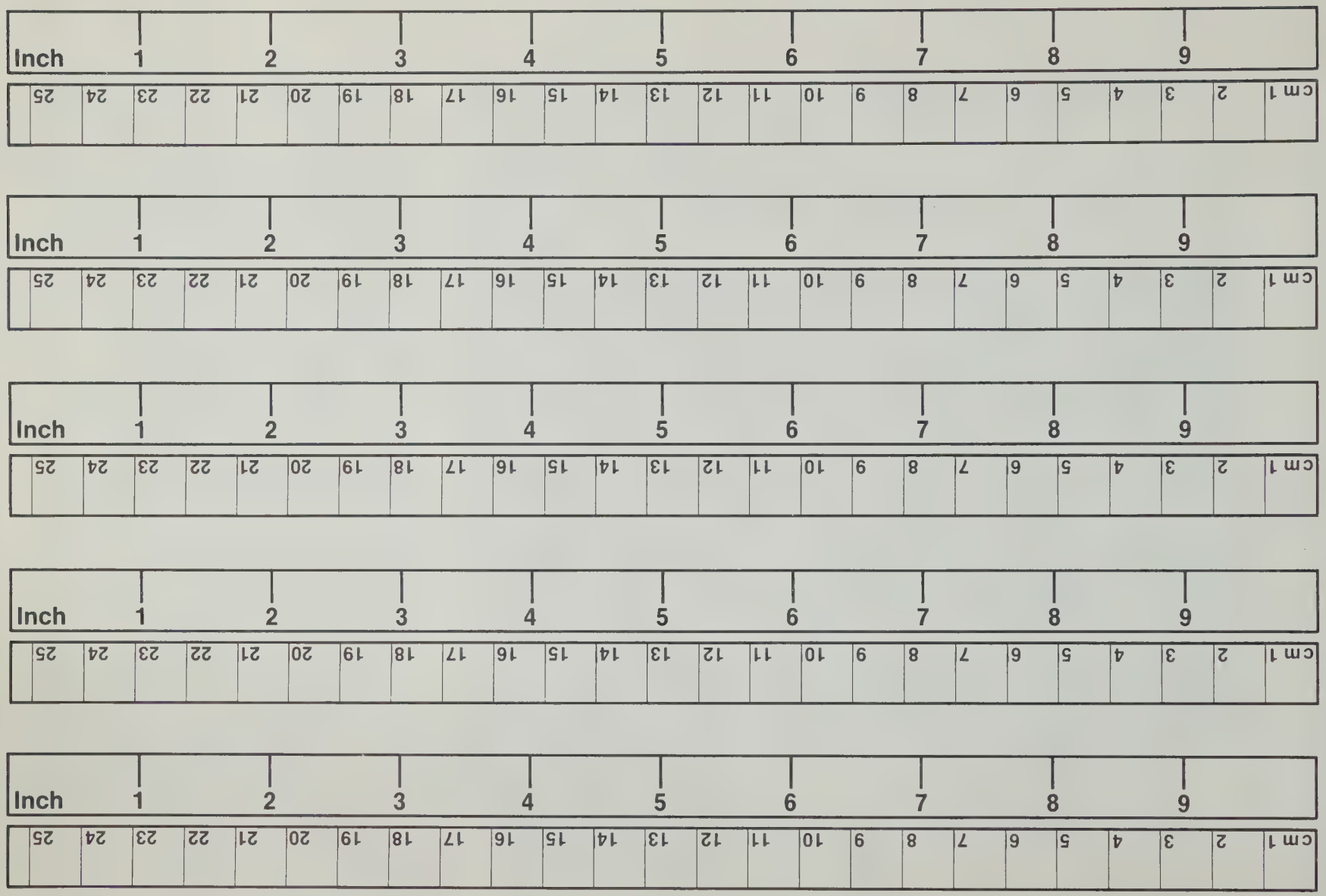
tens	ones
4	6 to start with
− 2	3 taken away
	remain

We will not be working with problems that require what we used to call borrowing. (It's called renaming now.) That comes later. Thinking subtraction is a big job in itself, and both time and practice are needed to really understand the whole process.

We'll start learning about renaming as we go back to the study of addition again. Before you try to help your child with this idea, please wait until he brings some pages from his book so that you can see how we are tackling the skill.

This will be one time that it may be very difficult for you to be patient, because it looks as if we are doing things the hard way; there are two years of research to back up this approach, however. Please let your child discover his own shortcuts when he's ready. I will sincerely appreciate your cooperation.

We're making good progress. Thank you for your interest and support.



© 1974, SRA Permission to reproduce for school use.

7 EXTENDING SUBTRACTION SKILLS

before this chapter the learner has —

1. Subtracted a 1-digit number from a 2-digit number, no renaming
2. Subtracted a multiple of 10 from a 2-digit number, no renaming
3. Mastered the subtraction facts

in chapter 7 the learner is —

1. Subtracting a 1-digit number from a 2-digit number, no renaming
2. Subtracting two 2-digit numbers, no renaming

in later chapters the learner will —

Subtract two 2-digit numbers with renaming

Notes & Things

This subtraction chapter begins with diagnostic practice of the subtraction facts—for a good reason. Success with the subtraction algorithm is directly dependent on each child's mastery of the facts.

The skill development in this chapter picks up the pattern started in Chapter 5. Please notice that the expanded notation is presented as a model to **think** about; the learner is not asked to compute a problem written in this form. There is a reason for this approach too. It is important that the child continue to operate with the number of ones first, then to operate with the number of tens. Expanded notation invites the child to operate with tens first and then with the ones, going from left to right just as he has been trained to do in reading. To change this pattern, it is very important that you continue your questions: How many ones remain? How many tens remain?

It is quite possible that the youngsters will not even notice that they are doing anything new when they are introduced to the subtraction of two 2-digit numbers. The thought-provoking situations in problem solving will help keep the youngsters' interest high.

Please notice the readiness training for renaming in subtraction on page 161. Manipulatives as well as number lines are important for this second look at the subtraction facts.

Both you and the children should have a real feeling of accomplishment at the end of this chapter. All the groundwork has been laid for success with subtraction. It will come!

words

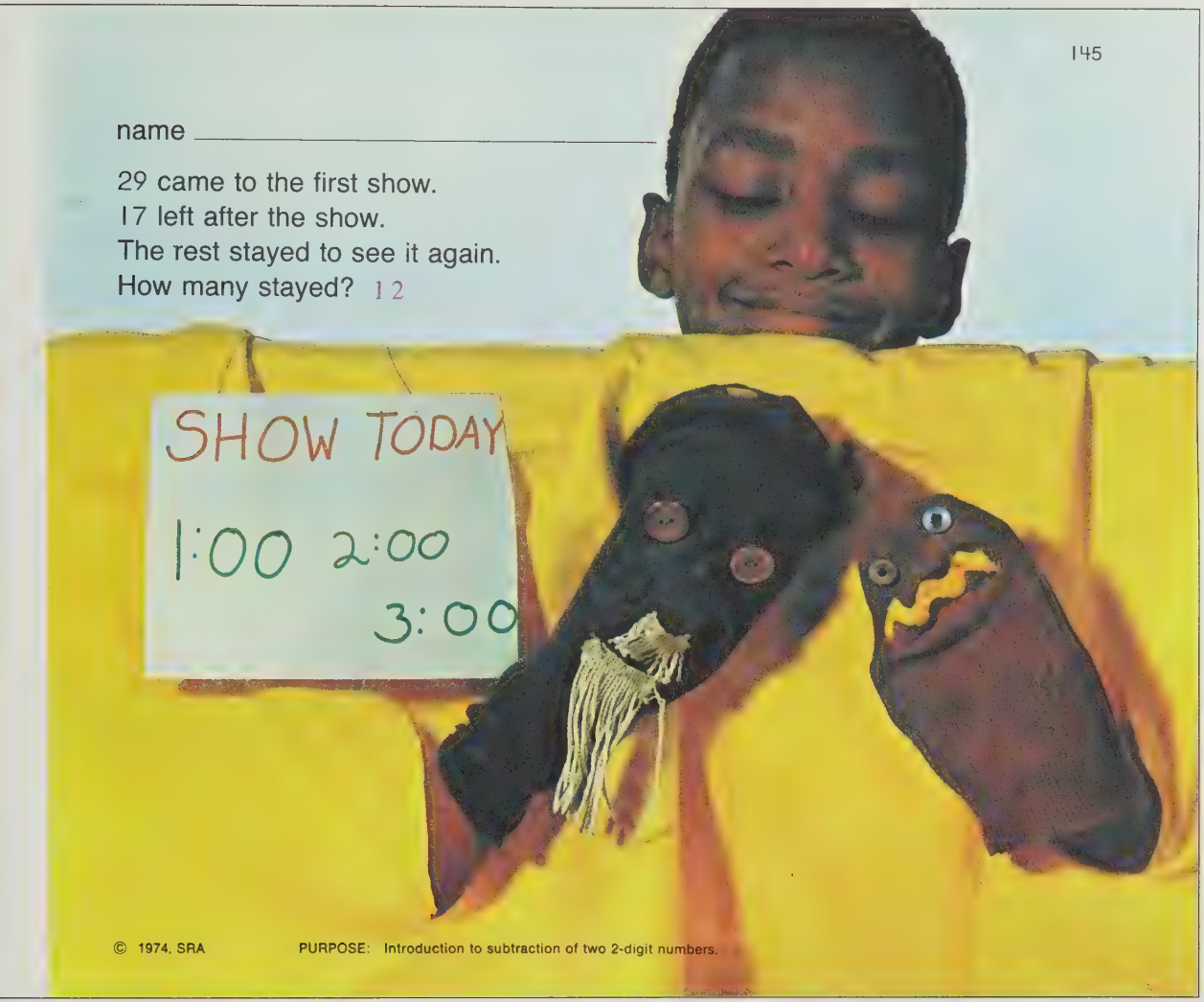
No new concept-development words are introduced in this chapter.

things

ten-trays
counters
number line on a transparency (optional)

For the extra activities you will want to have these things available:

- subtraction flash cards
  (See pages 64b and 101b.)
- magazines, newspapers
- small boxes
- tagboard
- laminating film or clear adhesive paper
- washable crayons
- individual place-value charts
- numeral cards
- index cards



lesson Page 145

goal **Survey**—subtracting two 2-digit numbers, no renaming

page 145 Talk about the picture. *What kind of show will it be? How many shows are being given?* Read the problem aloud. Have everyone write his answer on a small piece of paper and on the page. Collect the pieces of paper and on the board make a tally chart of the answers. Examine the chart. *How many different answers did you find? Which answer did most of you find? How many answers are correct?* Tell them which answer is correct. *Who found that answer? How did you get that answer?*

It is quite likely that the answer will be found by counting from 17 to 25. A child's common sense won't let what adults call "renaming" get in the way. If there are no correct answers, that's O.K. too. Continue the theme in order to present two more problems. *Let's pretend some other numbers of people were in the story.*
37 came. 15 left. How many stayed? Any correct answers?
59 came. 27 left. How many stayed? Any correct answers to this one?

We are going to find answers to problems like this in just no time at all. Let's make it our goal. We are going to learn how to subtract big numbers!

If you have some children who answered all three problems correctly, you'll know they don't need to spend time on this chapter. They have already achieved the goal. Do have them help you as peer tutors, and use the activities available that will challenge them.

lesson Pages 146, 147

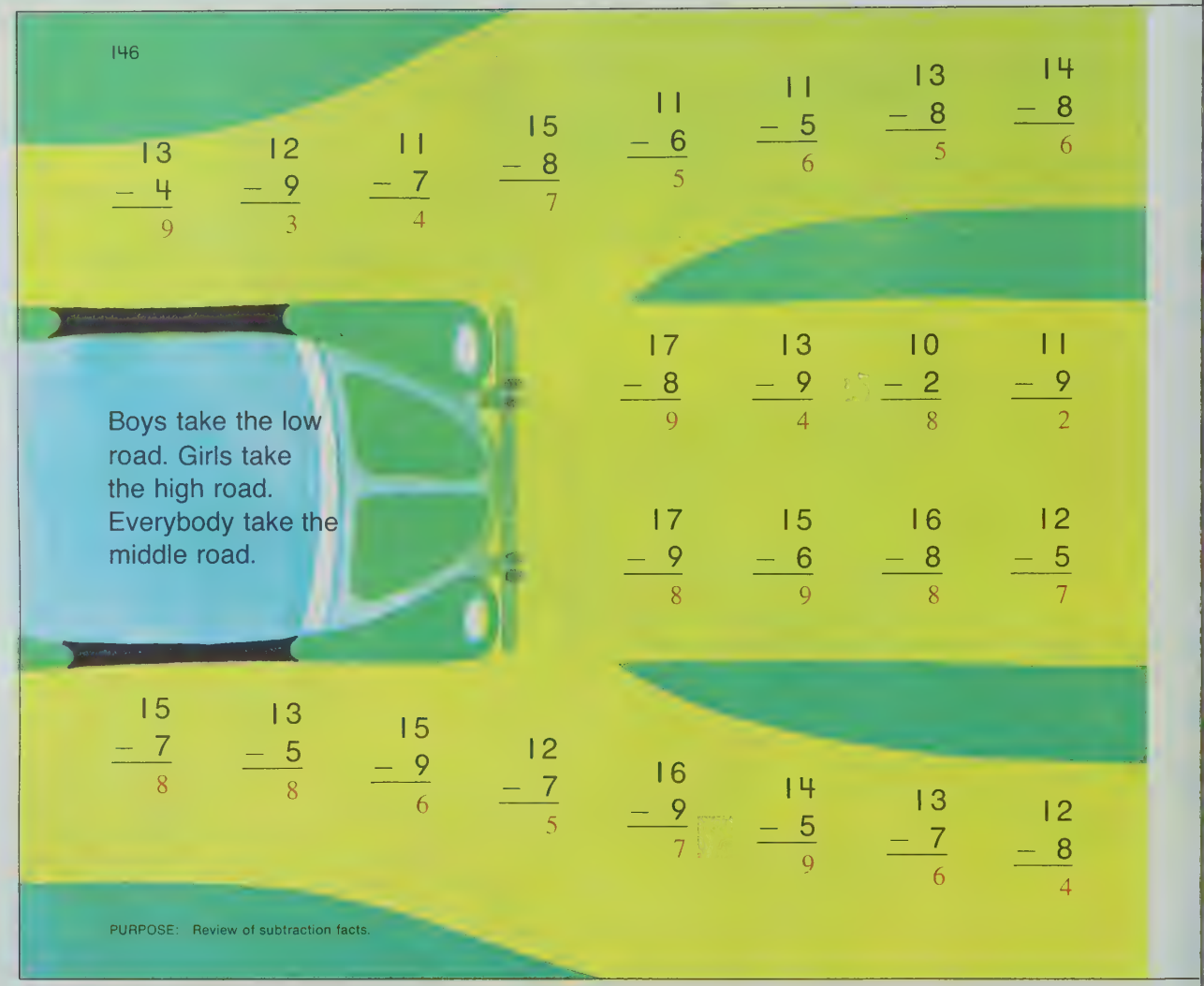
goal Review of subtraction facts

page 146 Use this page to help you identify those pupils who need more practice with the subtraction facts.

Read the directions together. Draw attention to the subtraction symbol. When everyone has finished, girls get together to check their problems and boys get together to check theirs. Check the middle road together.

Each person should correct his errors and practice these facts so that he can find the answers to big problems like the one on page 145.

Tease a bit. *Did the boys or the girls have the easiest problems to do?*



Have the youngsters form a circle—a circle of witches. One player is selected to be **It,** and three are selected to go into the witches' oven (inside the circle). **It** walks around outside the circle, stops behind a player, and says a subtraction fact. If the player can answer correctly before someone in the oven can, he is the new **It.** If someone in the oven answers correctly first, this player escapes from the oven and joins the witches' circle. The player who was beaten goes into the oven. The old **It** moves on to another player, and the game continues.

name _____

Pick any three sets of subtraction exercises.

7 − 6 = 1	5 − 0 = 5	8 − 3 = 5	5 − 3 = 2
8 − 1 = 7	7 − 4 = 3	8 − 4 = 4	7 − 2 = 5
11 − 4 = 7	12 − 6 = 6	10 − 3 = 7	13 − 7 = 6
15 − 9 = 6	14 − 6 = 8	16 − 9 = 7	12 − 7 = 5

10 − 4 = 6	13 − 8 = 5	11 − 6 = 5	11 − 5 = 6
14 − 7 = 7	14 − 9 = 5	13 − 6 = 7	15 − 7 = 8
15 − 6 = 9	18 − 9 = 9	12 − 4 = 8	17 − 8 = 9
13 − 4 = 9	16 − 7 = 9	15 − 8 = 7	13 − 9 = 4

© 1974, SRA PURPOSE: Subtraction practice.

goal Practice with subtraction facts

memo The subtraction facts are a necessary tool for success in subtraction computation. A few minutes of practice each day will build confidence and speed. Drill need not be boring. Use the activities and games suggested in this guide together with others you already know.

page 147 The problems are grouped by levels of difficulty.

Read the directions together. Now for the big decision—which three sets to do. Observe the youngsters as they work. Who still needs counters of some kind? This includes fingers. These children need more practice along with those who make errors and those who take forever to arrive at an answer. Praise those who make no errors. Encourage the others and then get on with the practice.

things subtraction flash cards

Someone is chosen to be in charge of displaying one flash card at a time. Another person is chosen to begin the game by standing next to someone seated. A flash card is shown. If the person standing is the first to give the correct answer, he moves to the next person seated and waits for a new problem. If the person seated is the first to give the correct answer, he changes places with the one standing and moves on to the next person seated. To go "Around the World" a pupil must successfully race every person in the group.

lesson Pages 148, 149, 150

goal Introduction to subtraction of a 1-digit number from a 2-digit number, no renaming

things for each group:
3 ten-trays
39 counters
sheet of paper
pencil

warm-up Group the children—4 or 5 to a group. Have each group select a secretary to record the action. Everyone in the group helps to decide what should be written after each step.

Show 37 with your trays and counters. Record. *Take away 6.* Record. *How many remain? What does* **remain** *mean?* Repeat the action for 28 take away 4.

page 148 Moving from concrete objects to the picture is a big step for some learners. Nice and easy. Talk about what's happening as you go and how each step can be recorded. Let the youngsters try the last three problems by themselves. Check these by duplicating the action with ten-trays and counters.

148

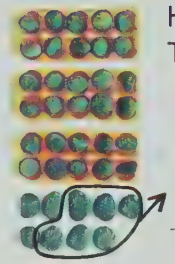
How many ten-trays? 2

How many more? 6

Ring 5. Take them away.
How many ten-trays remain? 2

How many more? 1

	tens	ones
2 tens 6 →	2	6
– 5 →	–	5
2 tens 1 →	2	1



Here are 3 ten-trays and 9 more.
The ring shows 6 being taken away.

	tens	ones	
3 tens 9	3	9	to start with →
– 6	–	6	taken away →
3 tens 3	3	3	How many remain? → remain

TRY THESE.

tens	ones	
4	5	to start with
–	4	taken away
4	1	remain

tens	ones	
2	7	to start with
–	3	taken away
2	4	remain

tens	ones	
3	8	to start with
–	6	taken away
3	2	remain

PURPOSE: Introduction to subtraction of a 1-digit number from a 2-digit number.

name _____

	tens	ones	
3 tens	7	3	7 — to start with
−	6	−	6 — taken away
3 tens	1	3	1 — remain

How many remain?

tens	ones
4	5
−	4
4	1

tens	ones
2	8
−	5
2	3

tens	ones
4	9
−	8
4	1

tens	ones
5	3
−	3
5	0

tens	ones
2	9
−	6
2	3

tens	ones
6	7
−	6
6	1

tens	ones
3	9
−	2
3	7

tens	ones
2	3
−	2
2	1

tens	ones
1	8
−	3
1	5

tens	ones
8	7
−	6
8	1

2 cartons of ten and 6 more too.

She took 5 and left 21 for you.

3 packages of ten and 9 more too.
He took 39, and that made me blue.

Why? There were none left.

© 1974, SRA PURPOSE: Subtracting a 1-digit number from a 2-digit number.

goal Practice in subtracting a 1-digit number from a 2-digit number, no renaming

things 4 ten-trays
50 counters

page 149 Go over the example together. Stress subtracting ones first. *How many ones remain? How many tens?* Have everyone do the first three problems. Check the answers with ten-trays and counters. Anyone who got all three problems right should be able to proceed independently while you work with the others. Use ten-trays and counters with these youngsters.

When checking have anyone who makes an error work the problem with trays and counters.

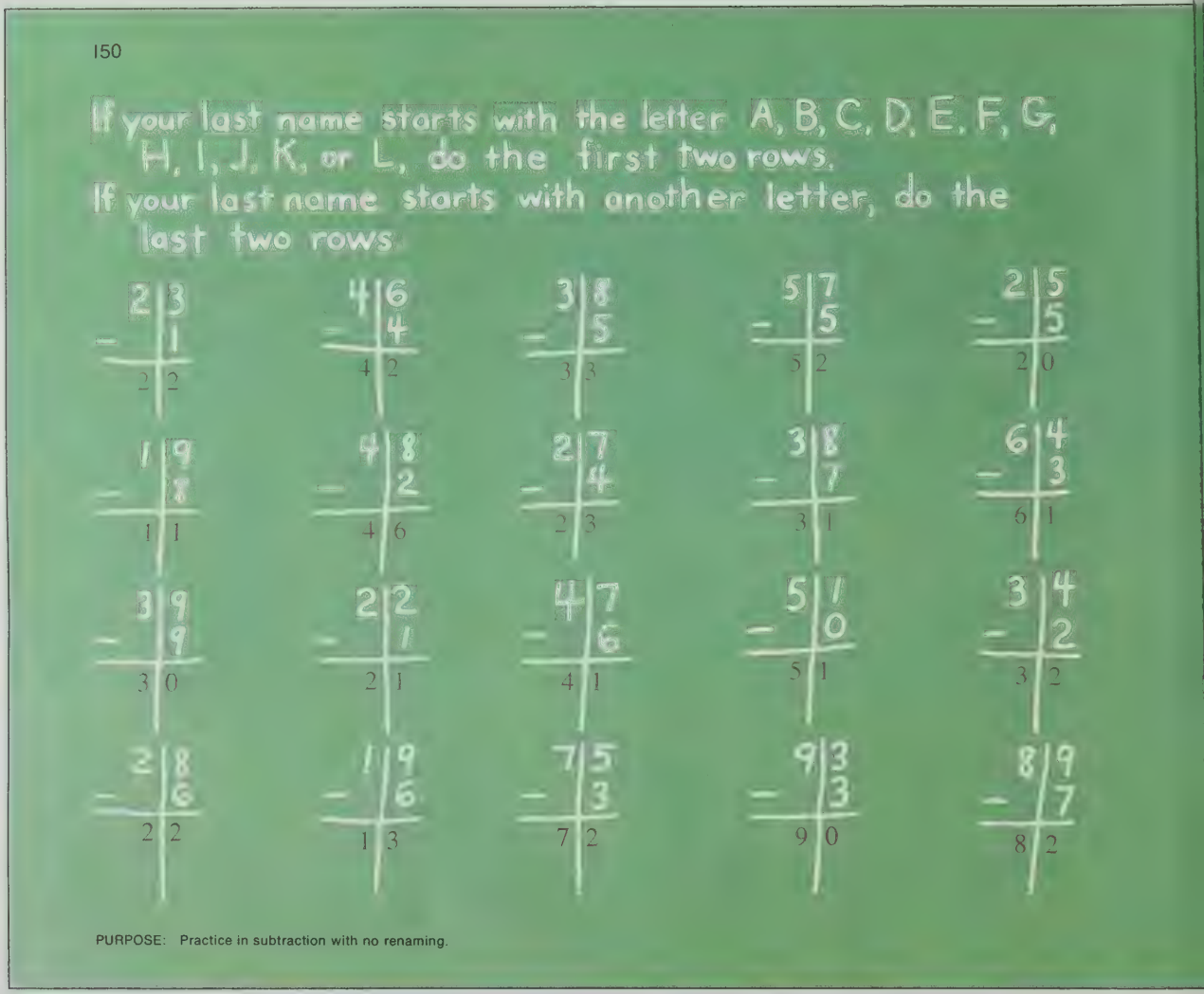
Help with reading the words for the word problems. You'll want to talk about the last problem. If anyone doesn't understand why, demonstrate with manipulatives.

goal Practice in subtracting a 1-digit number from a 2-digit number, no renaming

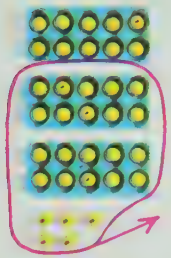
memo Notice that the place-value headings are missing, but the fine rule that separates tens and ones is still in each problem. The headings will gradually disappear from computation pages to come. Their absence should not cause any trouble, but be watchful on this page to make sure.

page 150 Read those directions carefully. No one wants to do more work than he has to. *What kind of problems are these?* (Subtraction) *Where will you begin?* (With the ones)

Use this page to determine whether more work is needed in this type of subtraction. Have pupils who make errors rework those problems with trays and counters. If facts are the source of the trouble, drill facts rather than stressing more practice with this kind of problem.


150
If your last name starts with the letter A, B, C, D, E, F, G, H, I, J, K, or L, do the first two rows.
If your last name starts with another letter, do the last two rows.
23 − 1 = 22
46 − 4 = 42
38 − 5 = 33
57 − 5 = 52
25 − 5 = 20
19 − 8 = 11
48 − 2 = 46
27 − 4 = 23
38 − 7 = 31
64 − 3 = 61
39 − 9 = 30
22 − 1 = 21
47 − 6 = 41
51 − 0 = 51
34 − 2 = 32
28 − 6 = 22
19 − 6 = 13
75 − 3 = 72
93 − 3 = 90
89 − 7 = 82
PURPOSE: Practice in subtraction with no renaming.

name _____



How many?
Ring 2 tens and 5.
Take them away.
How many tens remain?
How many more?

	tens	ones
3 tens 5	3	5
− 2 tens 5	− 2	5
1 ten 0	1	0

Here are 4 ten-trays
and 2 more.
12 taken away.

	tens	ones
4 tens 2 — to start with →	4	2
− 1 ten 2 — away →	− 1	2
3 tens 0 — These remain →	3	0

TRY THESE.

tens	ones	
3	7	to start with
− 2	7	taken away
1	0	remain

tens	ones	
5	3	to start with
− 3	3	taken away
2	0	remain

tens	ones	
5	6	to start with
− 1	6	taken away
4	0	remain

© 1974, SRA

PURPOSE: Introduction to subtraction of two 2-digit numbers.

lesson Pages 151, 152

goal Introduction to subtraction of two 2-digit numbers, no renaming

things for each group:
4 ten-trays
49 counters

memo Skill in subtracting two 2-digit numbers is developed through a sequence of ministeps. The first step came in chapter 5 when a multiple of 10 was subtracted from a 2-digit number. This step is reviewed on page 153.

The second step consists of subtracting all the ones and some of the tens. This step is the emphasis of pages 151 and 152.

warm-up Everyone in groups. No secretary is necessary. *Show 46 with your trays and counters. To take away 16, how many ones will you take away? How many tens? How many remain?* Repeat for 47 take away 27, and 32 take away 22. *Is there anything special about these problems? How many ones remained each time?* Not sure? Then try 48 take away 18.

page 151 Work through the two examples together. Let everyone try the three problems at the bottom on his own. Check them with ten-trays and counters.

goal Practice in subtracting two 2-digit numbers, no renaming

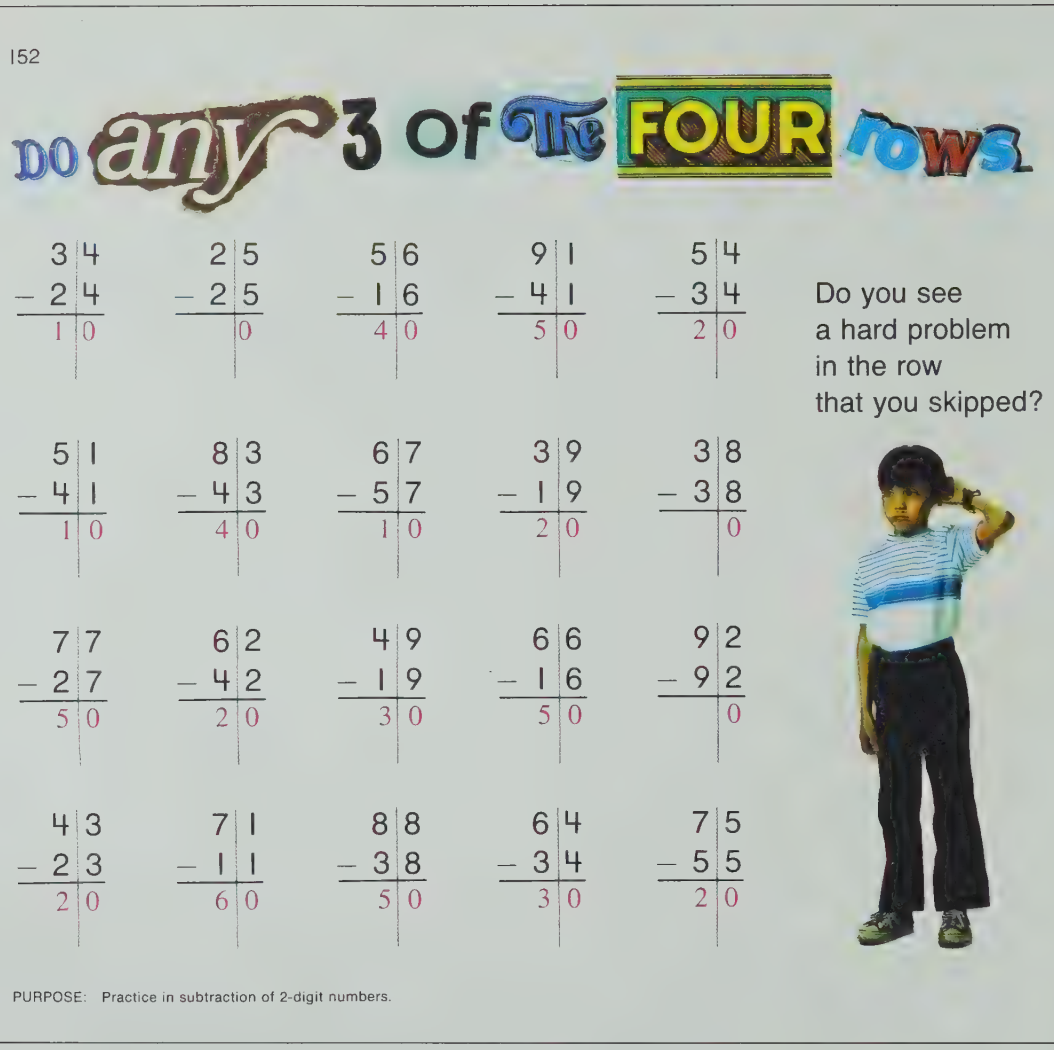
memo You may want to start offering a series of thought steps that will be helpful to many children.

How many to start with?
How many to be taken away?
How many ones remain?
How many tens remain?
What's your answer?

page 152 Read the directions together. Let each person decide for himself which three rows to do. Have each ring any hard problem in the row that is skipped.

Have pupils who make errors rework those problems with trays and counters.

Make a list of the hard problems. Talk about why these problems might seem hard. Work these problems together. *Were they really hard?*



name _____

A store counted all the cans of vegetables on the shelf.
The owner attached a sheet of paper with the number of each item.

The café got this:

20 CANS CARROTS
20 CANS CORN
10 CANS TOMATOES
30 CANS PEAS
30 CANS POTATOES
30 CANS BEANS

How many remained on the shelf?

32 cans carrots

27 cans corn

19 cans tomatoes

35 cans peas

8 cans potatoes

5 cans beans

Then a lady wanted 10 cans of potatoes and 10 cans of beans.

Could she get them at this store? No

© 1974, SRA

PURPOSE: Subtracting in story situations.

lesson Page 153

goal Review of subtracting a multiple of 10 from a 2-digit number

memo This is a good problem-solving page, but it isn't easy. All the information is presented in one big bunch. The youngsters have to sort out that information before they can even start on the problems. Give help if necessary. But most important, give enough time to get the problems solved.

page 153 Talk about why the store owner needs to know how many of each kind of can he has. Does anyone need help with words? *How will you find how many cans remain on the shelf?* Let everyone start work independently. If any children get into trouble, encourage them to get help from someone in the group. Peer tutors can do a good job in situations such as this.

lesson Pages 154, 155

goal Practice in subtracting two 2-digit numbers, no renaming

things for each group:
4 ten-trays
49 counters

memo The youngsters are about to take another step. They will subtract, and they will not always end up with 0 ones in their answer. Consider repeating those steps again here.
How many to start with?
How many to be taken away?
How many ones remain?
How many tens remain?
What's your answer?

warm-up Everyone into groups—you decide if a secretary is needed. *Show 47 with your trays and counters. Listen carefully. Don't let me trick you. To take away 13, how many ones will you take away? How many tens?* Lead the children to see that taking away a full tray and 3 more is the fastest, easiest way. *How many remain?* Repeat for two or three more examples. Focus on the action—ones taken from ones, tens taken from tens.

page 154 Work together to complete the page. Focus on subtracting first ones and then tens.

154

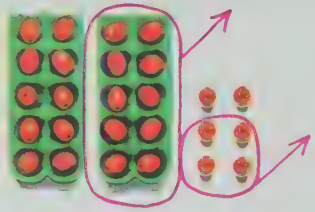
The jars were in boxes. Each full box had 10 jars.

There were 3 full boxes, and 1 box had only 4.
Bob needed 12 jars. He took a full box
and 2 out of the opened box.

How many full boxes remained? 2

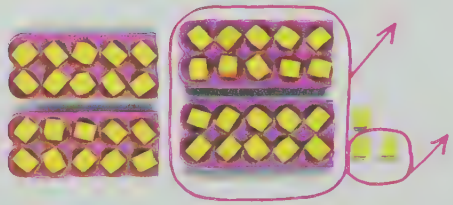
How many more jars? 2

Record what is happening.



How many in all?
Ring 14 and take them away.
How many remain?

tens	ones
2	6
− 1	4
1	2



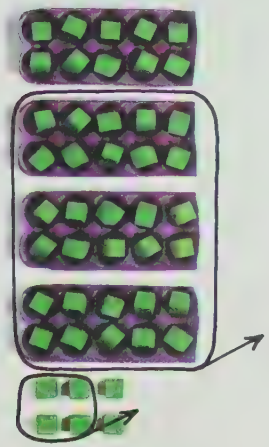
How many in all?
Ring 22 and take them away.
How many remain?

tens	ones
4	3
− 2	2
2	1

PURPOSE: Subtracting in story situations.

name _____

People with blue eyes do the first two rows. Everyone else do the last two rows.



29 − 18 = 11	33 − 21 = 12	47 − 34 = 13	56 − 26 = 30	65 − 43 = 22
78 − 50 = 28	94 − 52 = 42	88 − 24 = 64	39 − 32 = 7	98 − 75 = 23
88 − 16 = 72	78 − 62 = 16	86 − 72 = 14	56 − 55 = 1	96 − 41 = 55
46 − 34 = 12 ← to start with / ← taken away / ← remain	79 − 19 = 60	98 − 33 = 65	97 − 60 = 37	54 − 41 = 13	67 − 33 = 34

© 1974, SRA

PURPOSE: Practice in subtraction of 2-digit numbers.

goal Practice in subracting two 2-digit numbers, no renaming

things 5 ten-trays
59 counters

warm-up Display 35 with ten-trays and counters. Ask someone to take away 23—the easy way. Have another child record the action on the chalkboard. Repeat for 55 to take away 41.

page 155 Have everyone complete the example. *Are there any questions?* Read the directions together. Those eyes must really be blue—not just kinda blue.

Let the blue-eyed children check the results of the other group and vice versa. If an error is made, the pupil should rework the problem with trays and counters to correct his error. Continue to practice the facts to build speed and accuracy.

lesson Pages 156, 157

goal **Progress Check**—subtracting two 2-digit numbers, no renaming

page 156 *What kind of problems are these?*

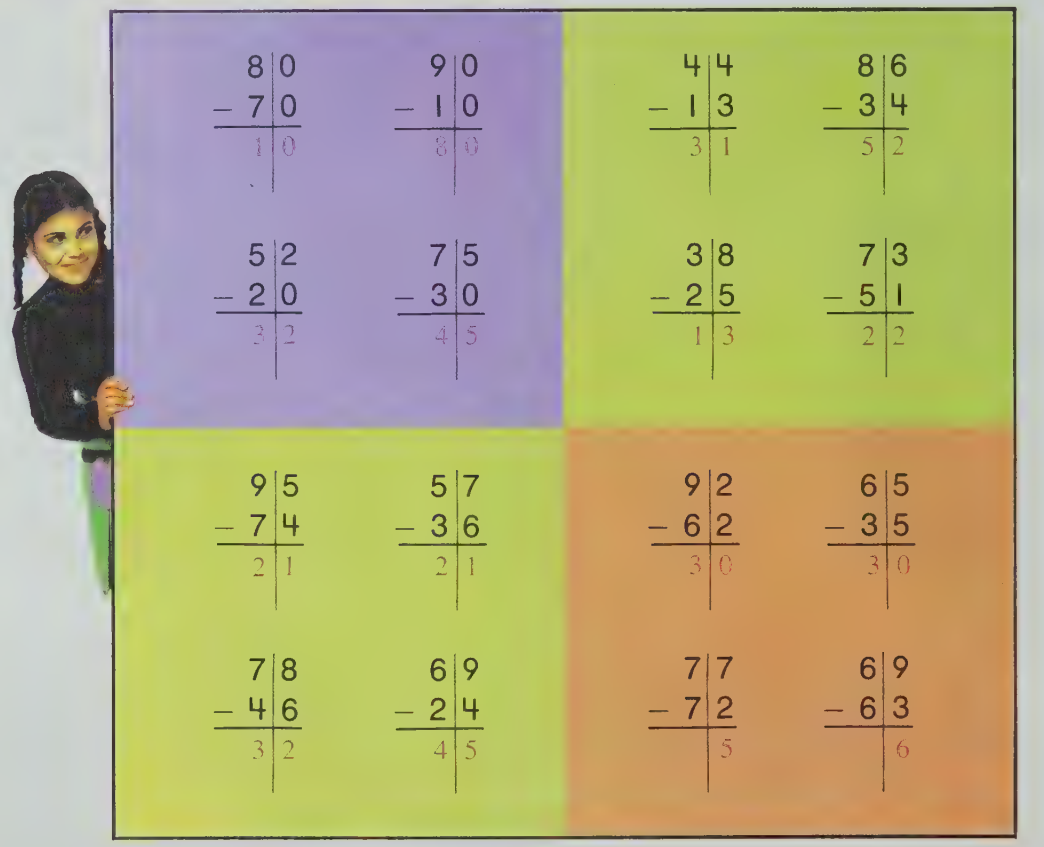
Ready! Set! Go!

Examine all errors carefully. Is there a pattern? All the problems fall under one of these types:

80	52	65	95	77
− 70	− 20	− 35	− 24	− 72
			71	5

Does the pupil consistently miss one kind of problem? Does everyone miss only one kind of problem? Are the errors random and the result of not having mastered the facts? Answers to these questions will help you provide the specific type of practice needed.

Do your best on this page.



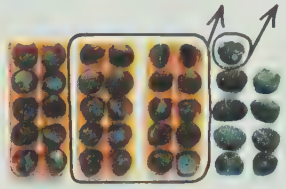
80 − 70 = 10	90 − 10 = 80	44 − 13 = 31	86 − 34 = 52
52 − 20 = 32	75 − 30 = 45	38 − 25 = 13	73 − 51 = 22
95 − 74 = 21	57 − 36 = 21	92 − 62 = 30	65 − 35 = 30
78 − 46 = 32	69 − 24 = 45	77 − 72 = 5	69 − 63 = 6

PURPOSE: Progress check—subtraction.

See activity 1, page 163a.

See activity 2, page 163a.

name _____



$$\begin{array}{r} 39 \\ -\ 21 \\ \hline 18 \end{array}$$

39 ← to start with
21 ← taken away
18 ← remain

Find the hardest problem in each row. Put a ring around it.
Complete all the others.

$\begin{array}{r} 27 \\ -\ 14 \\ \hline 13 \end{array}$	$\begin{array}{r} 46 \\ -\ 23 \\ \hline 23 \end{array}$	$\begin{array}{r} 68 \\ -\ 57 \\ \hline 11 \end{array}$	$\begin{array}{r} 71 \\ -\ 10 \\ \hline 61 \end{array}$	$\begin{array}{r} 59 \\ -\ 24 \\ \hline 35 \end{array}$	$\begin{array}{r} 62 \\ -\ 40 \\ \hline 22 \end{array}$
$\begin{array}{r} 59 \\ -\ 42 \\ \hline 17 \end{array}$	$\begin{array}{r} 49 \\ -\ 17 \\ \hline 32 \end{array}$	$\begin{array}{r} 87 \\ -\ 13 \\ \hline 74 \end{array}$	$\begin{array}{r} 58 \\ -\ 34 \\ \hline 24 \end{array}$	$\begin{array}{r} 96 \\ -\ 12 \\ \hline 84 \end{array}$	$\begin{array}{r} 76 \\ -\ 56 \\ \hline 20 \end{array}$
$\begin{array}{r} 47 \\ -\ 36 \\ \hline 11 \end{array}$	$\begin{array}{r} 89 \\ -\ 68 \\ \hline 21 \end{array}$	$\begin{array}{r} 83 \\ -\ 52 \\ \hline 31 \end{array}$	$\begin{array}{r} 98 \\ -\ 62 \\ \hline 36 \end{array}$	$\begin{array}{r} 94 \\ -\ 54 \\ \hline 40 \end{array}$	$\begin{array}{r} 76 \\ -\ 21 \\ \hline 55 \end{array}$

© 1974, SRA PURPOSE: Subtraction practice.

goal Practice in subtracting two 2-digit numbers, no renaming

memo Use this page with pupils who need more practice. Pupils who made no errors on the Progress Check can skip this page and go directly to pages 158 and 159.

page 157 Don't assign this page until the pupil is ready. Review the specific type of problem that is causing trouble. Let each child decide when to do the page.

The need to know the facts certainly is obvious to every child by now. If it isn't, why not take time for an individual conference and pep talk?

lesson Pages 158, 159, 160

goal Practice in subtracting two 2-digit numbers, no renaming

page 158 Some pupils will be able to handle the cookie problem independently, while others will need help to get started. Why not use peer tutors for this job?

The past performance of your pupils will determine who can afford to skip the computation practice. Skipping these problems should not worry you. Pages 159 and 160 provide more challenging practice.

Complete.

5 girls were each supposed to make at least 48 cookies for a bake sale. Find out how many cookies each girl had yet to make.

	Number of cookies to make	Number made	Number to make
Jan	48	12	36
Betty	48	24	24
Judy	48	36	12
Kay	48	48	0
Eve	48	0	48

SUBTRACT

97 − 75 = 22	96 − 74 = 22	95 − 73 = 22	94 − 72 = 22	93 − 71 = 22	92 − 70 = 22
87 − 65 = 22	86 − 54 = 32	85 − 43 = 42	84 − 32 = 52	83 − 21 = 62	82 − 10 = 72

PURPOSE: Subtraction practice.

name _____

Everybody was supposed to sell tickets.
Everybody started with 100 tickets.
Some had sold some tickets.

	Number to sell on Monday	Number sold by Friday	Number yet to sell
	75	64	11
	52	11	41
	49	38	11
	64	62	2
	86	55	31
	23	13	10
	81	70	11
	10	10	0
	37	26	11

Ring who sold the most last week.
Make tears for the one who has the most yet to sell.

© 1974, SRA PURPOSE: Subtraction practice.

goal Practice in subtracting two 2-digit numbers, no renaming

things scratch paper

page 159 Help set the scene for this problem situation. If ticket selling is an ongoing project in your school, relate the project to this page. Provide scratch paper for everyone to do the necessary computation. Pupils who are capable of getting the answer mentally should be encouraged to do so. They can always check any errors with paper and pencil.

things individual place-value charts, numeral cards, problem cards

The emphasis is on mental computation. Use this activity only with pupils who are ready.

Prepare a set of problem cards—2-digit subtraction, no renaming, with answers on the back. One problem is shown at a time. The youngsters work the problems mentally and show the answer in their place-value charts. The charts are then held up for the leaders to quickly check answers.

goal Practice in subtracting two 2-digit numbers, no renaming

page 160 Read the directions together. *Why does it say do as* **few** *problems as necessary? How will you decide which problems are necessary?* You may want to have the youngsters first trace the path to the medal with crayon before they begin to compute. To earn the medal, all the problems on the path must be computed correctly. *How many of you will earn a medal? What special thing should we do for those who earn a medal?* Let the group decide.

Give pupils who make an error an opportunity to do the other problems for a second chance to earn a medal.

160

Do as *few* problems as necessary to earn a blue ribbon for subtraction.

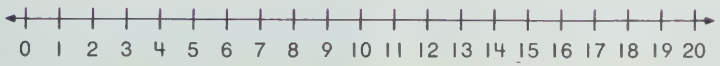
84 − 11 = 73	27 − 15 = 12	51 − 21 = 30	36 − 24 =	45 − 32 =	87 − 52 =	88 − 72 =
48 − 23 = 25	58 − 12 = 46	64 − 53 = 11	55 − 33 =	76 − 25 =	59 − 37 =	89 − 68 =
72 − 41 =	63 − 22 = 41	49 − 16 = 33	99 − 78 =	54 − 34 =	67 − 42 =	79 − 38 =
43 − 31 =	78 − 26 = 52	37 − 14 = 23	65 − 44 = 21		75 − 35 = 40	69 − 57 =
94 − 82 =	66 − 56 =	74 − 71 =	89 − 51 = 38	68 − 17 = 51	86 − 41 = 45	97 − 46 =

PURPOSE: Subtraction practice.

161

name _____

Ring the subtraction that you cannot show on this number line.



6 − 3	6 − 8	6 − 0	6 − 6	6 − 7	6 − 5	What is the greatest number you can subtract from 6? 6
8 − 0	8 − 9	8 − 5	8 − 2	8 − 8	8 − 7	What is the greatest number you can subtract from 8? 8
9 − 4	9 − 8	9 − 6	9 − 1	9 − 9	9 − 0	What is the greatest number you can subtract from 9? 9

What do you think is the greatest number you can subtract from 1? 1
Check and see if you are right.
What numbers can you subtract from 0? 0 Are you sure? Yes

© 1974, SRA PURPOSE: Special review of subtraction facts.

lesson Page 161

goal Readiness for subtraction with renaming

memo Some children never seem to get the idea that there are times when they cannot subtract whole numbers. For them renaming for subtraction is just a pattern of marks to be followed. The purpose of this page is to build readiness for the concept of renaming by emphasizing that there **are** times when whole-number subtraction **is not** possible.

page 161 Notice the limitation imposed by the number line. It should eliminate any conflict with what the pupil will come to know about negative numbers. Work this page together. If the youngsters do not see the point, have them show each subtraction with a number line on the chalkboard or on a transparency. When the first section is complete, ask for another number subtracted from 6 that cannot be shown on the number line. Use this procedure for the entire page. Take all the time the children need. This concept is vital for success in chapter 10.

lesson Pages 162, 163

goal **Checkout**—subtracting two 2-digit numbers, no renaming

page 162 *Does this page look familiar? Who remembers what to do?* Make sure that directions are clear.

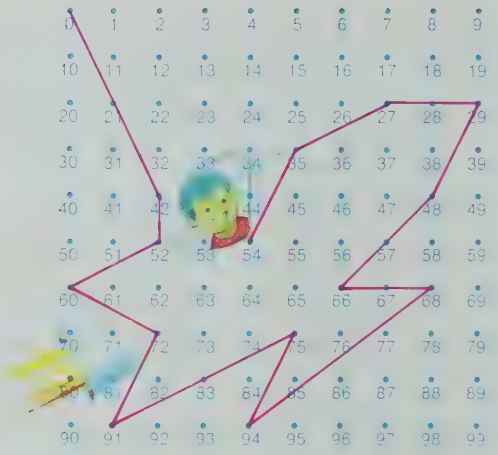
Examine all errors carefully. Check especially problems that involve a zero. For example:

87	92	94	88
− 87	− 32	− 0	− 20

If zero turns out to be a demon for someone, talk about these four kinds of problems with that individual.

If facts continue to be a problem for certain children, ask for help from their parents. Prepare a list of facts that are troublesome for the child, and offer suggestions of games that can be used for practice.

To connect the dots, complete each row of problems below. Start at the dot having the same number as your first answer. Draw a line to the dot for your second answer. Keep going until you reach your last answer.



87 − 87 = 0	77 − 35 = 42	96 − 44 = 52			
92 − 32 = 60	88 − 16 = 72	99 − 8 = 91	98 − 23 = 75	94 − 0 = 94	88 − 20 = 68
87 − 21 = 66	69 − 21 = 48	59 − 30 = 29	67 − 40 = 27	57 − 22 = 35	98 − 44 = 54

PURPOSE Checkout—subtraction.

See activity 3, page 163b.

See activity 4, page 163b.

name _____

5 boys went to a carnival. They each took some money with them. They each spent some money. Find out how much money they had left when it was time to go home.

Money to start with	Money spent	Money to take home
Jim: 48 cents	25 cents	23 cents
Jake: 35 cents	32 cents	3 cents
Doug: 57 cents	[illegible] cents	12 cents
Bill: 40 cents	35 cents	5 cents
Pete: 65 cents	[illegible] cents	0 cents

© 1974, SRA PURPOSE: Subtraction practice.

goal Application involving subtraction of two 2-digit numbers, no renaming

page 163 Use this page with pupils who are capable of working independently while you work with any who need your guidance. Some youngsters will need paper to do the computation. Encourage those who are capable to compute mentally.

Notice Bill's money and the amount he spent. Even though renaming is required in the computation, rely on the child's knowledge of money and the ability to count from a number to find how much money remains to take home.

RESOURCES

another form of evaluation

for progress check – page 156

Subtract. Do your best.

60	80	43	76
−30	−10	−20	−50
30	70	23	26
55	74	39	97
−12	−32	−26	−34
43	42	13	63
67	35	59	88
−45	−13	−15	−53
22	22	44	35
72	57	89	48
−62	−27	−83	−45
10	30	6	3

for checkout – page 162

Subtract.

56	66	74	35	87
−34	−66	−41	−21	− 4
22	0	33	14	83
94	22	49	74	37
−24	− 2	−17	−30	−15
70	20	32	44	22
43	54	91	83	46
−13	−32	−60	−32	−40
30	22	31	51	6

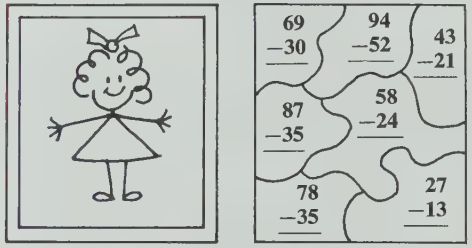
activities

1. things magazines, newspapers, shirt cardboard, paste, small boxes, scissors

Pupils hunt to find and cut out a picture they like—even their own photograph if they have a spare. Paste the pictures on the cardboard. When the paste is dry, turn pictures over, outline puzzle pieces, and cut apart. Write a problem similar to those on the page on each piece. Store each puzzle in a small box. Hosiery boxes are great!

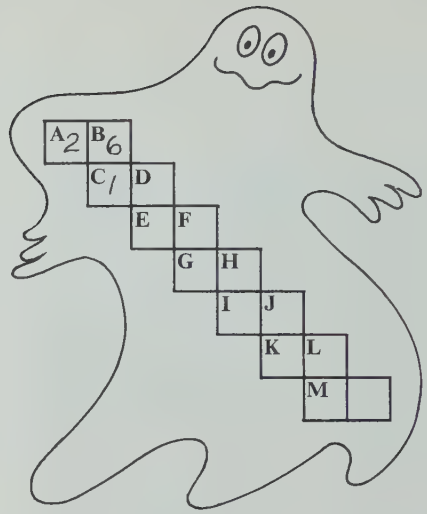
Pupils work with a tutor. The tutor holds the puzzle pieces. Each time the pupil gives the correct answer, he receives the puzzle piece. When he has all the pieces, he can put the puzzle together.

front **back**



2. things tagboard, laminating film or clear adhesive paper, washable crayons

Prepare a cross-subtraction puzzle on tagboard. An example is shown. Laminate the puzzle or cover it with clear adhesive paper. The pupils use washable crayons that can be wiped off with tissue or cloth. Talk about writing answers **down** as well as **across.**



Problems:

A 46	**B** 92	**C** 45	**D** 74
−20	−31	−30	−21
E 56	**F** 89	**G** 190	**H** 15
−24	−60	−100	−14
I 23	**J** 45	**K** 68	**L** 76
−11	−20	−17	−61
M 83			
−30			

3. things 16 index cards, counters

Write one of the following problems on each card—answers on the back of the card to settle disputes.

46	39	66	86
−21	−15	−23	− 0
23	56	95	78
−10	−33	−44	−70
43	72	16	37
−13	−60	− 6	− 1
79	21	99	87
− 8	−21	− 5	−20

Have each player make a game board by folding a piece of paper into 16 sections. Call out the following numbers: 0, 8, 10, 12, 13, 23, 24, 25, 30, 36, 43, 51, 67, 71, 86, 94. The players write these numbers on their game boards in any order, one per section.

The cards are mixed and one card is shown at a time. The players compute the answer, find this number on their game board, and cover it with a counter. First player to cover 4 numbers in a row, column, or diagonal calls out "Subtracto" and wins. The boards are cleared of counters, the problem cards are mixed again, and play continues.

4. things set of problem cards, container

Prepare a set of cards with problems like those found on the page—one problem on each card written large enough to be seen at a distance. Write the answers on the back. Place the cards in the containers.

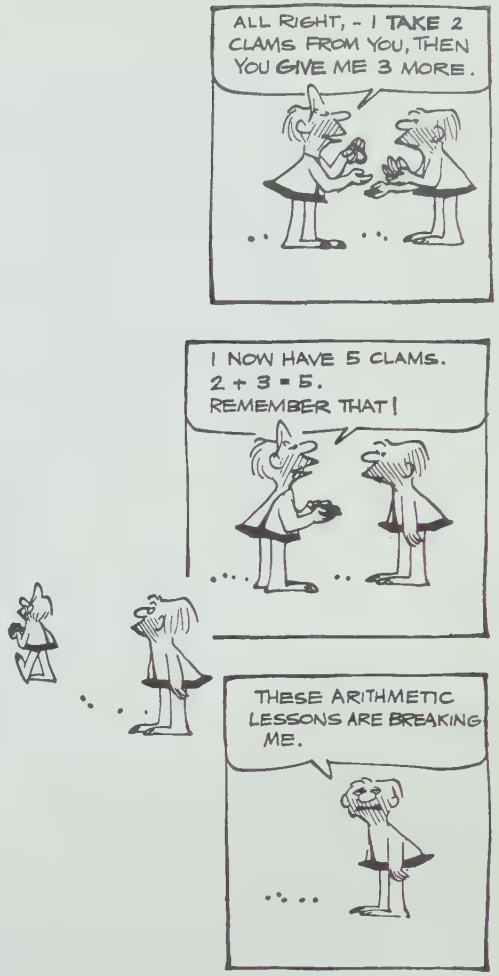
Form 2 teams of evenly matched players who stand in line facing each other. Ask the players to imagine they are standing on opposite banks of a river. A card is selected and displayed. The first member on each team competes to give the answer first. The loser must cross the river and go to the end of the other team's line. The team with the most number of members at the end of the playing time wins.

additional learning aids

operation—chapter objectives 1 and 2

SRA products

Computapes, SRA (1972)
Module 1, Lessons: AS 18, 19
Skill through Patterns, SRA (1974)
Spirit masters: 8, 18, 19, 25
Visual Approach to Mathematics, level 2, SRA (1967)
Visuals: 5, 10


ALL RIGHT, - I TAKE 2 CLAMS FROM YOU, THEN YOU GIVE ME 3 MORE.
I NOW HAVE 5 CLAMS. 2 + 3 = 5. REMEMBER THAT!
THESE ARITHMETIC LESSONS ARE BREAKING ME.

By permission of John Hart and Field Enterprises, Inc. © 1967

8 ADDITION WITH RENAMING

before this chapter the learner has —

1. Studied place value for 2-digit numbers
2. Added two 2-digit numbers, no renaming
3. Found the sum for three 1-digit numbers

in chapter 8 the learner is —

1. Introduced to adding two 2-digit numbers with renaming—sums less than 100
2. Introduced to adding three 2-digit numbers with renaming—sums less than 100

in later chapters the learner will —

1. Master finding the sum of any two 2-digit numbers
2. Master finding the sum of any three 2-digit numbers—provided the sum is not more than 100
3. Be able to show that the order in which three numbers are grouped for addition does not affect their sum

Notes & Things

Each youngster should know every addition fact by now. The children should remember their success with problems such as these:

tens	ones
6	4
+	5

and

tens	ones
3	7
+2	0

They certainly should be used to the questions, How many ones in all? and How many tens in all? And now for the exciting part—the thing big folks call renaming. The youngsters need not be burdened with the word *renaming*. In fact, the use of partial sums may seem perfectly obvious to everyone. In this chapter you will appreciate why so much time was spent on the number facts and on place value.

Expanded notation is used briefly to relate the action with the ten-trays to the algorithm that introduces addition with renaming. And by the way, please, please, please make sure those ten-trays are available for everyone to use. It is very important to have an extra empty tray to fill up in a problem such as the following:

tens	ones
3	4
+2	8

How many ones? Will 12 ones fill another ten-tray? How many trays can you fill with 12 ones? How many more ones outside?

This development should help the youngsters to accept easily the model shown on page 165. You will need, however, to watch all written responses. It is not unusual to see a child do this

tens	ones
3	4
+2	8
	12

It's not hard to understand why a youngster might make this notation error. He's not all wrong in this response. After all, 4 ones + 8 ones is 12 ones. Convincing that child that 12 can be thought of as 1 ten and 2 ones is a lot easier with the help of ten-trays. If 1 ten-tray can be filled, surely that ten must be recorded in the tens column and the 2 extra in the ones column.

The chapter offers lots of practice. Don't feel that it's necessary for all learners to use the short form of addition introduced on page 172. Each person will use it when he's ready. Forcing the short form is sure to backfire, and, believe it or not, the work with three 2-digit numbers will encourage lots of pupils to try the short form next time around.

At the end of the chapter, you will be so proud of most of your pupils that you might pop a button. If there are a few who didn't reach the level of achievement that you had hoped for, don't be discouraged. They will get lots of practice in the next chapter when they are learning about money. What a pleasant way to practice!

words

There are no new concept-development words for this chapter.

things

ten-trays
counters
red and green crayons

For the extra activities you will want to have these things available:

- spirit master
- larger numeral cards 10 through 18
- paper for game boards, markers
- 5 colors of yarn with matching pens, crayons, or pencils
- egg carton
- sugar or sponge cubes
- wood cubes
- numeral cards 0 through 20
- small cards
- envelopes

lesson Pages 164, 165, 166, 167

goal **Survey**—addition of two 2-digit numbers with renaming

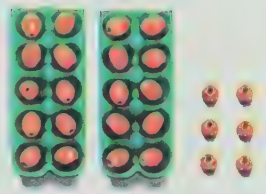
memo Use this page to help you identify those pupils who already know something about addition with renaming and may be capable of moving more quickly through this chapter.

page 164 This is a **ponder page.** The girl certainly looks as if she is pondering something. *What do you think is puzzling her? Can any of you help solve her problem?* Let the children show some of their ideas on the chalkboard or with ten-trays and counters. Let any pupils who think they know the answer use a piece of chalk to write the answer in their books. If no one can find a solution, that's all right too. Finding the sum for problems like this is the learning goal of everyone.

name _____

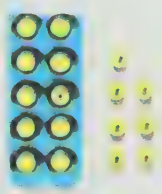
How many ten-trays? 2

How many more? 6



2 tens 6

Add 17 more



1 ten 7

Are there 3 tens 13 in all? Yes Can 10 of the 13 fill another ten-tray? Yes

Now how many ten-trays? 4 How many more? 3

	tens	ones
2 tens 6	2	6
+ 1 ten 7	+ 1	7
3 tens 13	1	3
How many tens and ones in 13?		
How many tens?	3	
How many in all?	4	3

	tens	ones
1 ten 5	1	5
+ 1 ten 9	+ 1	9
2 tens 14	1	4
How many tens and ones in 14?		
How many tens?	2	
How many in all?	3	4

© 1974, SRA

PURPOSE: Introduction to addition with renaming.

goal Introduction to addition with renaming

things for each group:
4 ten-trays
50 counters

warm-up Group the youngsters. Focus on the action, not on recording. *Use your trays and counters. Show a set of 27. How many full trays? How many loose ones? . . . Show a set of 14. How many full trays? How many loose ones? . . . Move the loose counters together. Can you fill another tray? How many full trays in all? How many loose ones now? How many in all?*

Use the same procedure for 19 plus 18, 25 plus 19, and 16 plus 19. Was another ten formed in the last example? Why not?

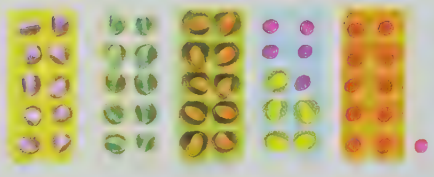
page 165 Work each problem with the children, using ten-trays and counters. A new step is added—recording the action. Go slowly. *Add the ones. How many?* (13) Record. *Add the tens. How many?* Record. *What does the 1 in 13 tell?* (Number of tens) *Can you fill another tray? Do it. How many in all?* Record.

goal Introduction to addition with renaming

things for each group:
5 ten-trays
60 counters

page 166 Continue with the same procedure used on page 165. Understanding why renaming happens is vital. Knowing how to record this action is important too. This is no time to skip steps in the development. Emphasize adding ones first, then adding the tens.

166



How many full ten-trays? 3

How many more? 5

How many in all? 35

Add 16 more to the picture.
Now how many
full ten-trays? 5

How many more? 1

How many in all? 51

3 tens 5
+ 1 ten 6
4 tens 11 — How many tens and ones in 11? → 1 1
How many tens? → 4
How many in all? → 5 1

tens	ones
3	5
+ 1	6
1	1
4	
5	1

Use your ten-trays for help.

tens	ones	
1	7	
+ 1	5	
1	2	Add the ones.
2		Add the tens.
3	2	How many in all?

tens	ones	
1	8	
+ 1	4	
1	2	Add the ones.
2		Add the tens.
3	2	How many in all?

tens	ones	
4	7	
+ 1	7	
1	4	Add the ones.
5		Add the tens.
6	4	How many in all?

PURPOSE: Introduction to addition with renaming (continued).

name _____

Sam had 1 box of ten and 7 more.
Jan had 2 boxes of ten and 4 more.
How many did they have in all?

1 ten	7	
+ 2 tens	4	
3 tens	11	How many tens and ones in 11? → 1 1
		How many tens? → 3
		How many in all? → 4 1

	1 7	
+	2 4	
	1 1	
	3	
	4 1	

tens	ones	
2	6	
+ 3	5	
1	1	Add the ones.
5		Add the tens.
6	1	How many in all?

tens	ones	
2	4	
+ 3	8	
1	2	Add the ones.
5		Add the tens.
6	2	How many in all?

6	3	
+ 1	9	
1	2	Add the ones.
7		Add the tens.
8	2	How many in all?

© 1974, SRA PURPOSE: Addition practice.

goal Practice in adding two 2-digit numbers with renaming

things ten-trays
counters

page 167 Talk about the example together. Ask lots of questions. *Where did the 11 come from? Where did the 3 come from? How did you get 4 tens?*

Let everyone try the first problem. Check the results together. Use ten-trays and counters to clear up any errors. Let those who are capable do the last three problems by themselves as you continue to work with the others. Continue to use the trays and counters.

lesson Pages 168, 169

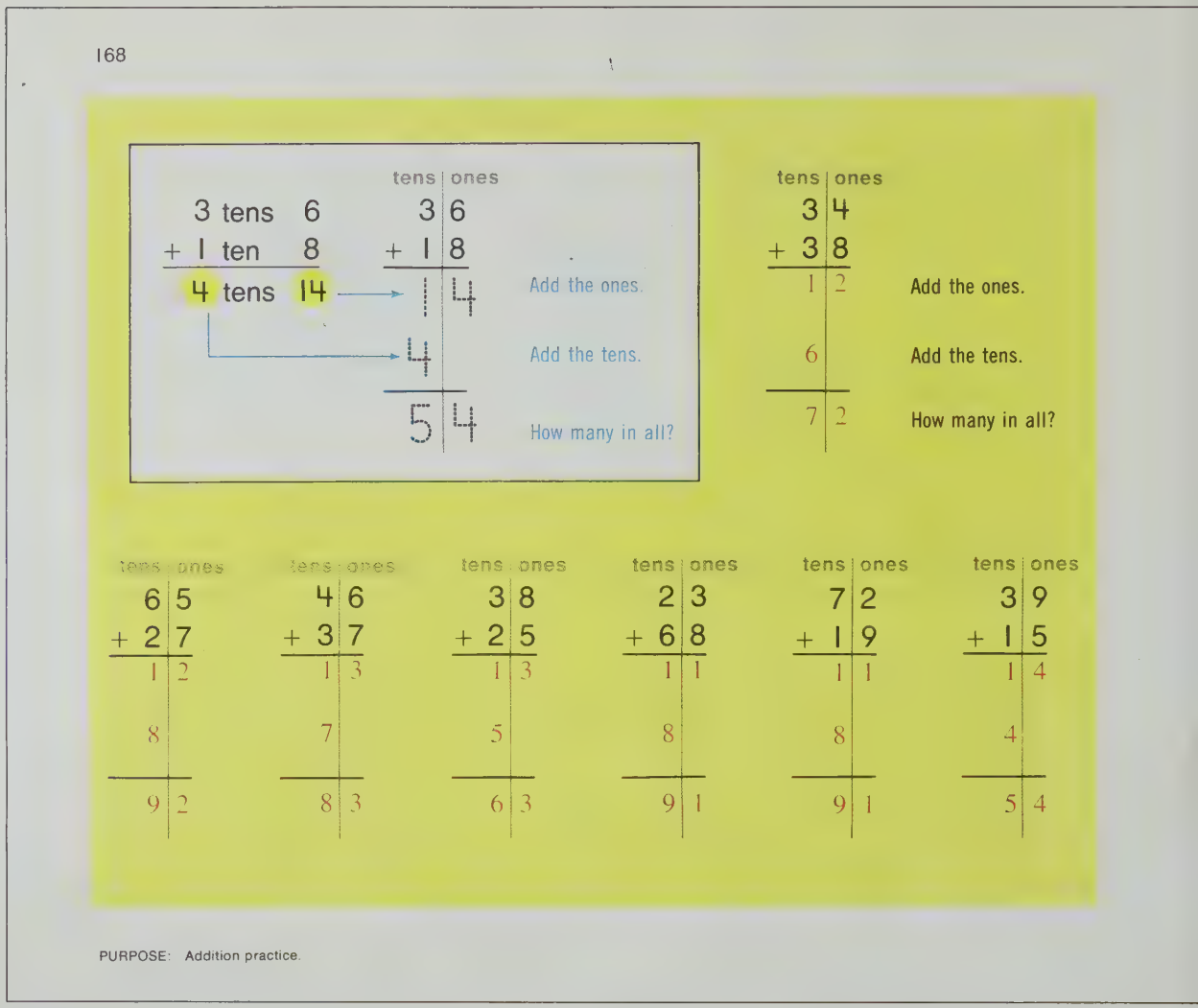
goal Practice in adding two 2-digit numbers with renaming

page 168 The emphasis now shifts from manipulation to computation. Pupils who feel insecure should continue to work with the aids as long as they are having trouble.

Focus on the example in the box. *What do you do first to find how many in all?* (Add *ones*) *What do you do next?* (Add tens) *Then what do you do?* (Add the ones and tens together)

Move to 34 + 38. *What do you do first? Where do you write the 12? What's the next step? Where do you write 6? What's the last step? Where do you write how many in all?*

Let the pupils work two or three problems by themselves. Check progress. Pupils who make no errors continue working by themselves while you continue to guide the others with—*Add the ones. Add the tens. How many in all?*



name _____

tens	ones	
1	7	
+ 2	4	
1	1	Add the ones.
3		Add the tens.
4	1	How many in all?

tens	ones	
6	7	
+ 1	9	
1	6	
7		
8	6	

169

collected 27. collected 19.

tens	ones	How many in all?
2	7	
+ 1	9	
1	6	Add the ones.
3		Add the tens.
4	6	How many in all?

add

49 miles east.
36 miles north.
How far in all?

tens	ones	
4	9	
+ 3	6	
1	5	Add the ones.
7		Add the tens.
8	5	How many in all?

45 in one bag.
5 in another bag.
How many in all?

tens	ones	
4	5	
+	5	
1	0	Add ones.
4		Add tens.
5	0	How many in all?

Surprise!
5 + 5 is 1 ten 0 ones.

© 1974, SRA

PURPOSE: Addition practice.

goal Practice in adding two 2-digit numbers with renaming

page 169 Does anyone need help with the words? Monitor each youngster's work. Make sure he is recording correctly as well as finding the correct answer. You'll want to talk about the last problem together. *Did the surprise fool anyone?* The book makes a big deal out of this because many youngsters want to put the 1 in the ones column and forget about that zero altogether.

lesson Page 170, 171

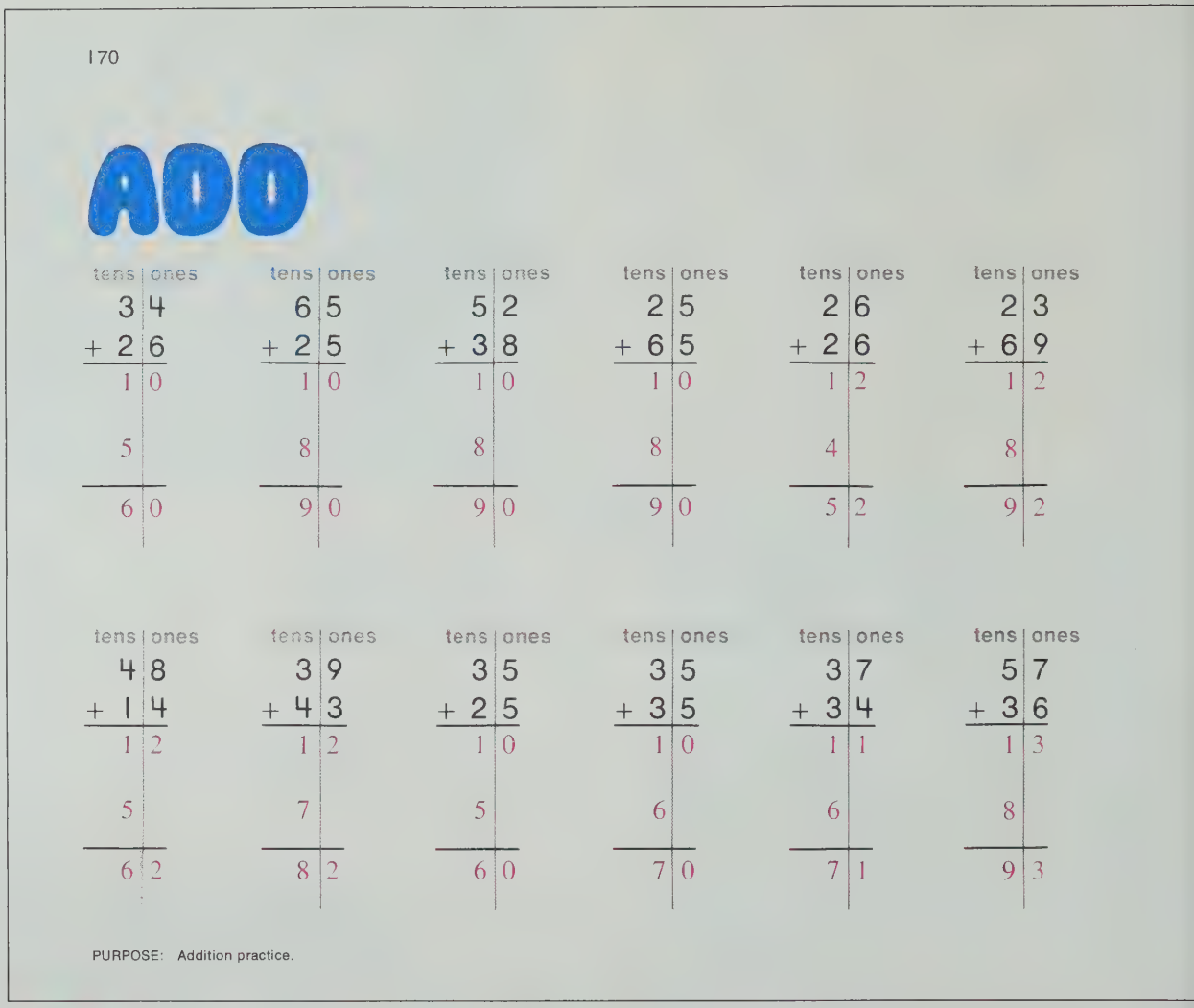
goal Practice in adding two 2-digit numbers with renaming

things red and green crayons

memo The problems on pages 170 and 171 are carefully controlled. The sum of the ones in each problem on page 170 is 10, 11, 12, or 13. Addition facts with sums of 15, 16, 17, and 18 are included on page 171. You will want to keep this in mind when examining any errors.

page 170 Time for all youngsters to show how really smart they are. *Do your very best. After you finish, use a red crayon to draw a ring around the hardest problem and a green crayon to draw a ring around the easiest problem.* Can the children explain why they made the choices they did?

Examine all errors. Are facts causing the trouble or is it in the recording? Have the pupil correct his errors by showing the problem with ten-trays and counters.



See activity 1, page 179a.

name _____

tens	ones
5	3
+ 2	8
1	1
7	
8	1

tens	ones
4	8
+	7
1	5
4	
5	5

tens	ones
3	5
+ 2	9
1	4
5	
6	4

tens	ones
1	8
+ 2	6
1	4
3	
4	4

tens	ones
4	8
+	8
1	6
4	
5	6

tens	ones
2	9
+ 2	3
1	2
4	
5	2

tens	ones
4	5
+ 4	5
1	0
8	
9	0

tens	ones
5	2
+ 1	9
1	1
6	
7	1

tens	ones
6	9
+ 1	9
1	8
7	
8	8

tens	ones
1	5
+ 6	8
1	3
7	
8	3

tens	ones
2	8
+	9
1	7
2	
3	7

tens	ones
4	7
+ 2	4
1	1
6	
7	1

© 1974, SRA

PURPOSE: Addition practice.

goal Practice in adding two 2-digit numbers with renaming

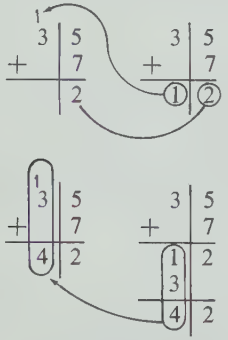
page 171 These problems should help identify pupils who have not completely mastered the hard addition facts. Examine errors carefully.

lesson Pages 172, 173

goal Introduction of the short algorithm (computation form) for addition with renaming

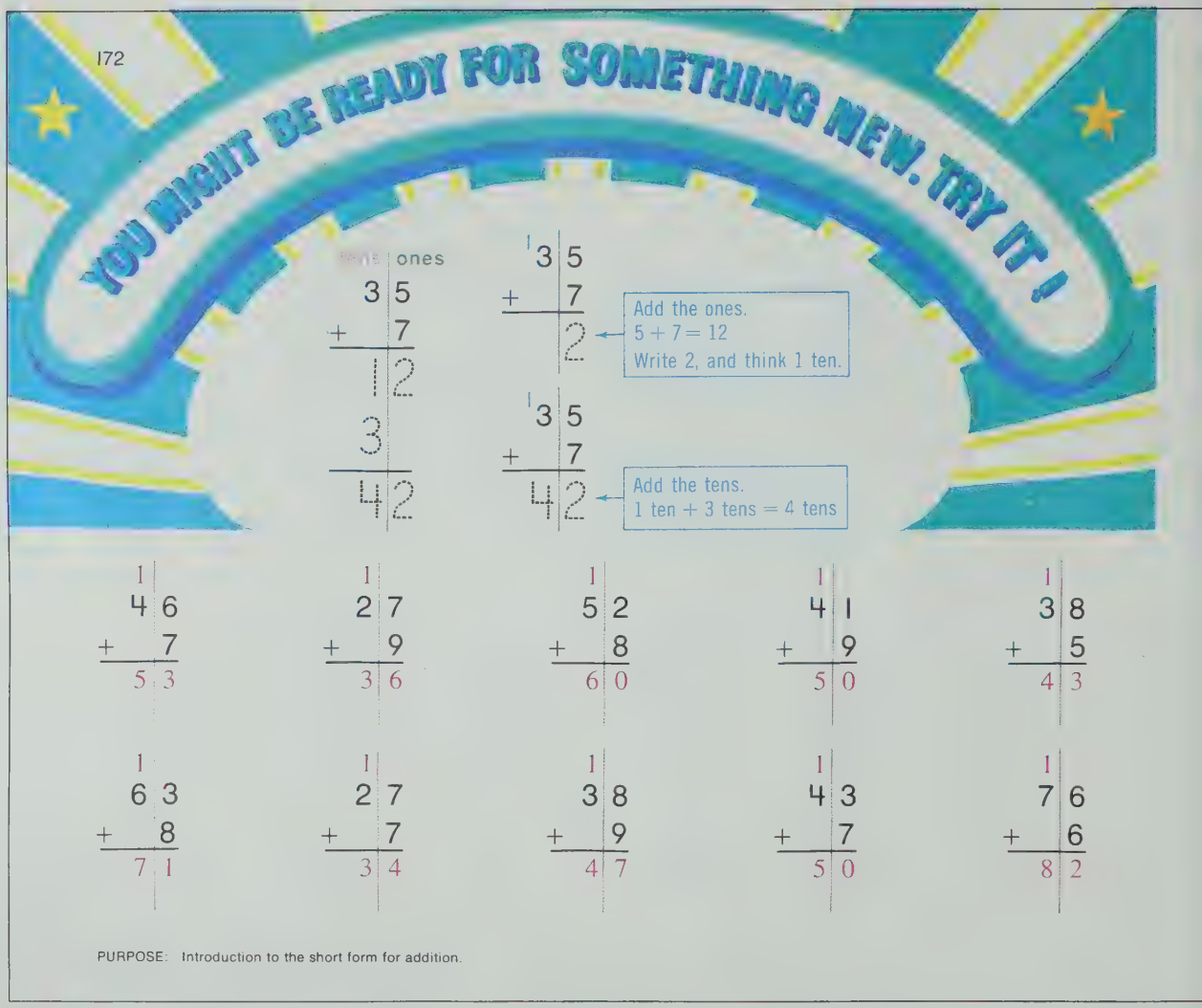
memo If you feel that some of your pupils are not ready for this step now, you may decide to postpone these pages until later in the year.

page 172 Work the example together. Relate the short form to the long form the children have been using.



All the numbers are there—only the ten is written in a different place so that all the tens can be added at one time. Work a few problems together, and then let the youngsters try a few on their own. Check progress. No use practicing the wrong thing.

Any child who is not ready to make this change should be assured that it's still O.K. to use the long form. Confidence and accuracy are more important than the algorithm used.


172
YOU MIGHT BE READY FOR SOMETHING NEW. TRY IT!
tens ones
3 5
+ 7
12
3
42
Add the ones.
5 + 7 = 12
Write 2, and think 1 ten.
Add the tens.
1 ten + 3 tens = 4 tens
46 + 7 = 53
27 + 9 = 36
52 + 8 = 60
41 + 9 = 50
38 + 5 = 43
63 + 8 = 71
27 + 7 = 34
38 + 9 = 47
43 + 7 = 50
76 + 6 = 82
PURPOSE: Introduction to the short form for addition.

See activity 2, page 179a.

name _____

tens	ones
2	4
+ 3	8
1	2
5	
6	2

$$\begin{array}{r} {}^{1}2\,4 \\ +\,3\,8 \\ \hline 2 \end{array}$$

Add the ones.
4 + 8 = 12
Write 2, and think 1 ten

$$\begin{array}{r} {}^{1}2\,4 \\ +\,3\,8 \\ \hline 6\,2 \end{array}$$

Add the tens.
1 ten + 2 tens + 3 tens = 6 tens

ADD

$$\begin{array}{r} {}^{1}2\,7 \\ +\,4\,5 \\ \hline 7\,2 \end{array} \qquad \begin{array}{r} {}^{1}4\,4 \\ +\,3\,9 \\ \hline 8\,3 \end{array} \qquad \begin{array}{r} {}^{1}3\,2 \\ +\,2\,8 \\ \hline 6\,0 \end{array} \qquad \begin{array}{r} {}^{1}4\,9 \\ +\,4\,4 \\ \hline 9\,3 \end{array} \qquad \begin{array}{r} {}^{1}6\,3 \\ +\,1\,8 \\ \hline 8\,1 \end{array}$$

$$\begin{array}{r} {}^{1}5\,8 \\ +\,3\,7 \\ \hline 9\,5 \end{array} \qquad \begin{array}{r} {}^{1}5\,4 \\ +\,2\,7 \\ \hline 8\,1 \end{array} \qquad \begin{array}{r} {}^{1}1\,9 \\ +\,1\,9 \\ \hline 3\,8 \end{array} \qquad \begin{array}{r} {}^{1}1\,7 \\ +\,5\,6 \\ \hline 7\,3 \end{array} \qquad \begin{array}{r} 6\,0 \\ +\,2\,9 \\ \hline 8\,9 \end{array}$$

© 1974, SRA

PURPOSE: Introduction to the short form for addition (continued).

goal Practice with addition of two 2-digit numbers, using the short algorithm

page 173 Review the short form for computation. Let the group tell you what to write, where, and why. Pupils who are capable should complete the page independently. Continue to work with the others. Remember, the long form is still in style for pupils not yet ready to make this change.

goal **Progress Check**—adding two 2-digit numbers with renaming

page 174 Use only the two rows of problems to check progress. Long form or short form? Encourage everyone to use the form with which he feels more comfortable.

Examine all errors. Divide pupils who made errors into two groups:

- Those who need practice with facts
- Those who need a reteaching session with you or capable peer tutors

Direct pupils who are having no trouble to the puzzles. They are to add across each row and write the sum in the appropriate box, and then add down each column and write the sum in the appropriate box. Add the sums down and across. These two answers are special—if no mistake was made, they will be the same. The youngsters will probably need to do computation on scratch paper.

174

Add

39 + 9 = 48	63 + 6 = 69	48 + 4 = 52	37 + 8 = 45	75 + 9 = 84	43 + 38 = 81
56 + 27 = 83	39 + 42 = 81	16 + 78 = 94	25 + 47 = 72	56 + 19 = 75	27 + 27 = 54

Add to complete each puzzle

OK.

+		
6	4	10
3	82	85
9	86	95

+		
6	16	22
26	36	62
32	52	84

+		
37	19	56
23	20	43
60	39	99

+		
29	17	46
38	12	50
67	29	96

PURPOSE: Progress check—addition.

See activity 3, page 179a.

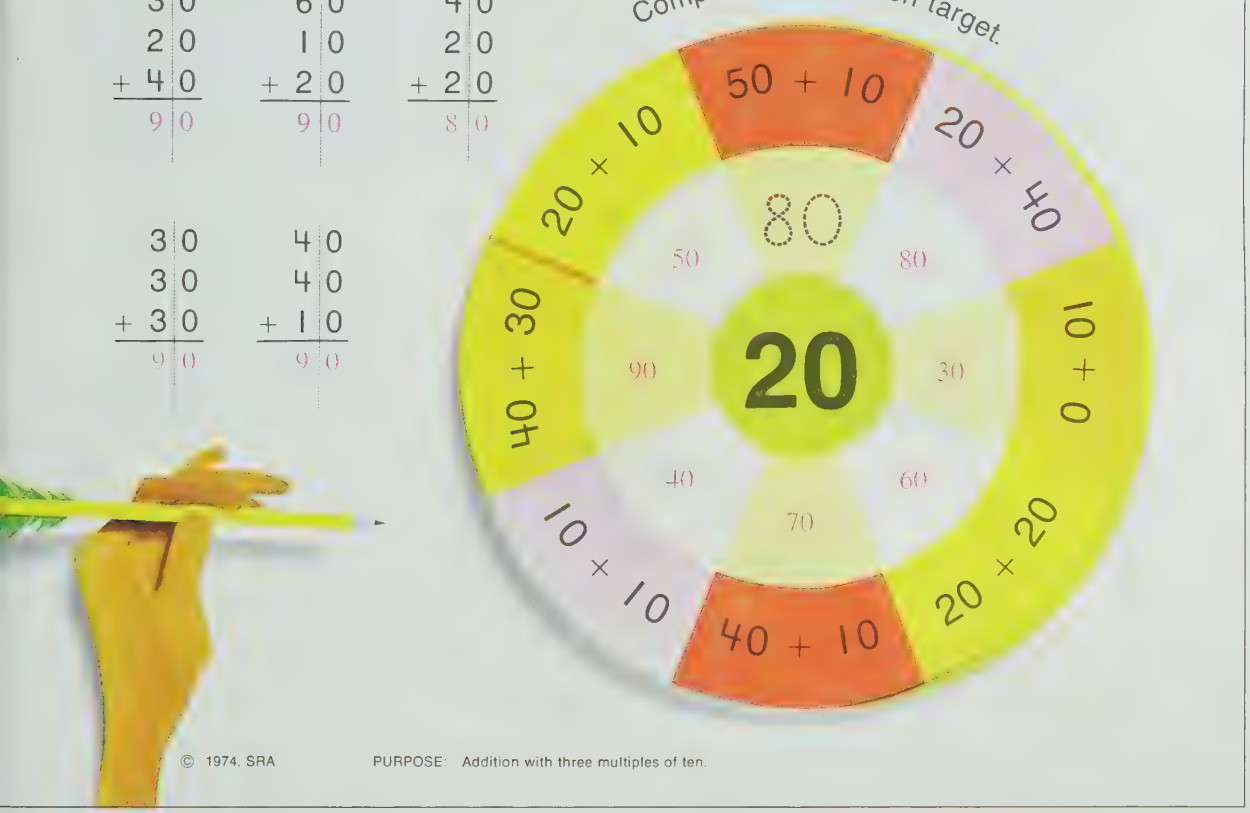
See activity 4, page 179a.

name _____

Add

30	60	40
20	10	20
+ 40	+ 20	+ 20
90	90	80

30	40
30	40
+ 30	+ 10
90	90



© 1974, SRA PURPOSE: Addition with three multiples of ten.

things wood cubes labeled with 2-digit multiples of 10, counters

Use the labeled cubes. Form sets of 3 cubes. The counters help keep score. The 3 cubes are rolled and the faceup numbers added. Take one counter for a correct answer and return one counter for a wrong answer. The player with the most counters wins.

lesson Pages 175, 176

goal Introduction to adding three 2-digit multiples of 10

warm-up Write on the board:

3	1
2	5
+ 4	+ 2

Have two children find the sums. Write the following next to the problems already on the board:

30	10
20	50
+ 40	+ 20

Is 9 the correct answer for this problem? What is the right answer? Repeat for the second problem.

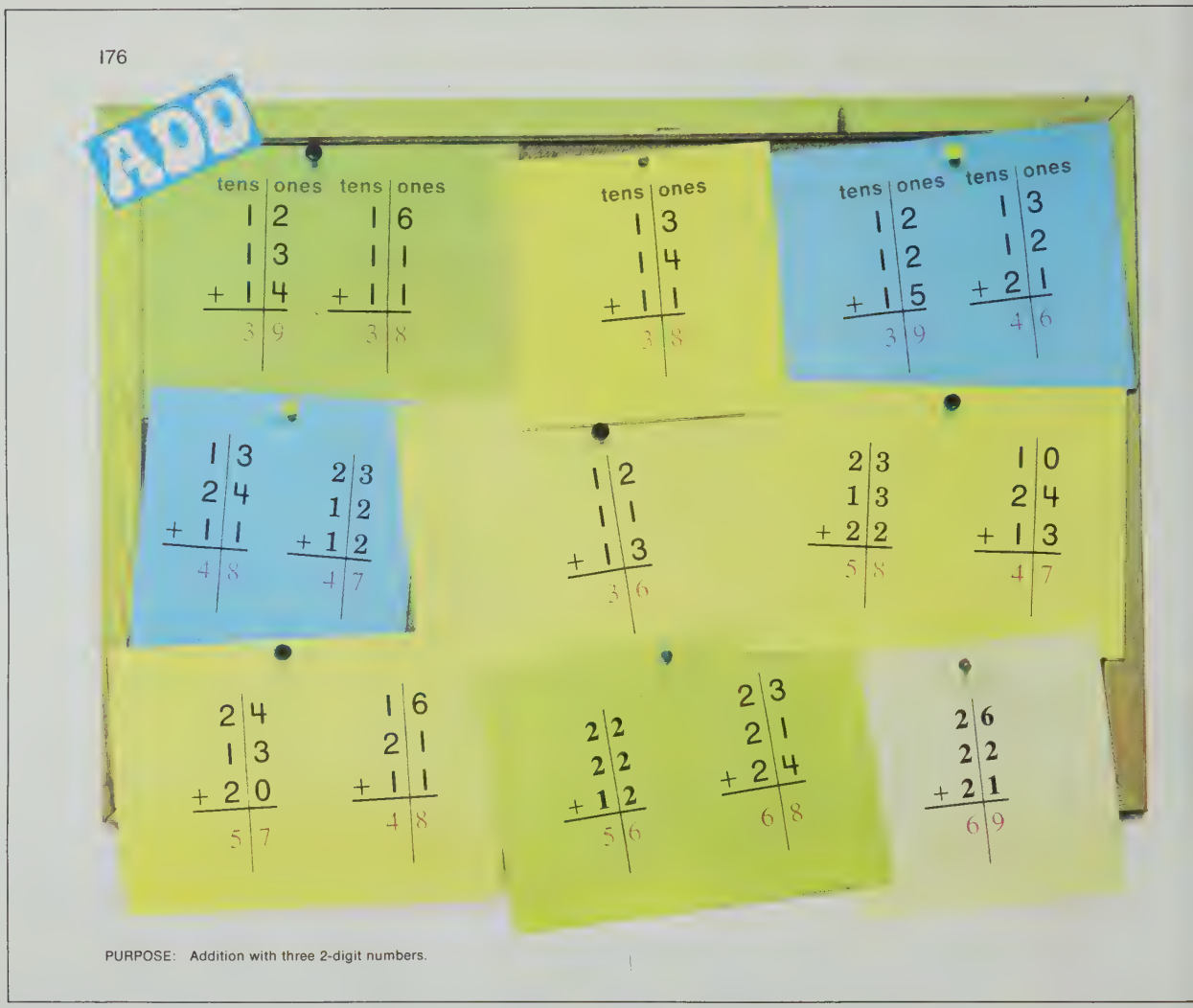
page 175 The row of problems is not difficult. No sum is over 90.

Review how to work the addition wheel. Everyone should work by himself.

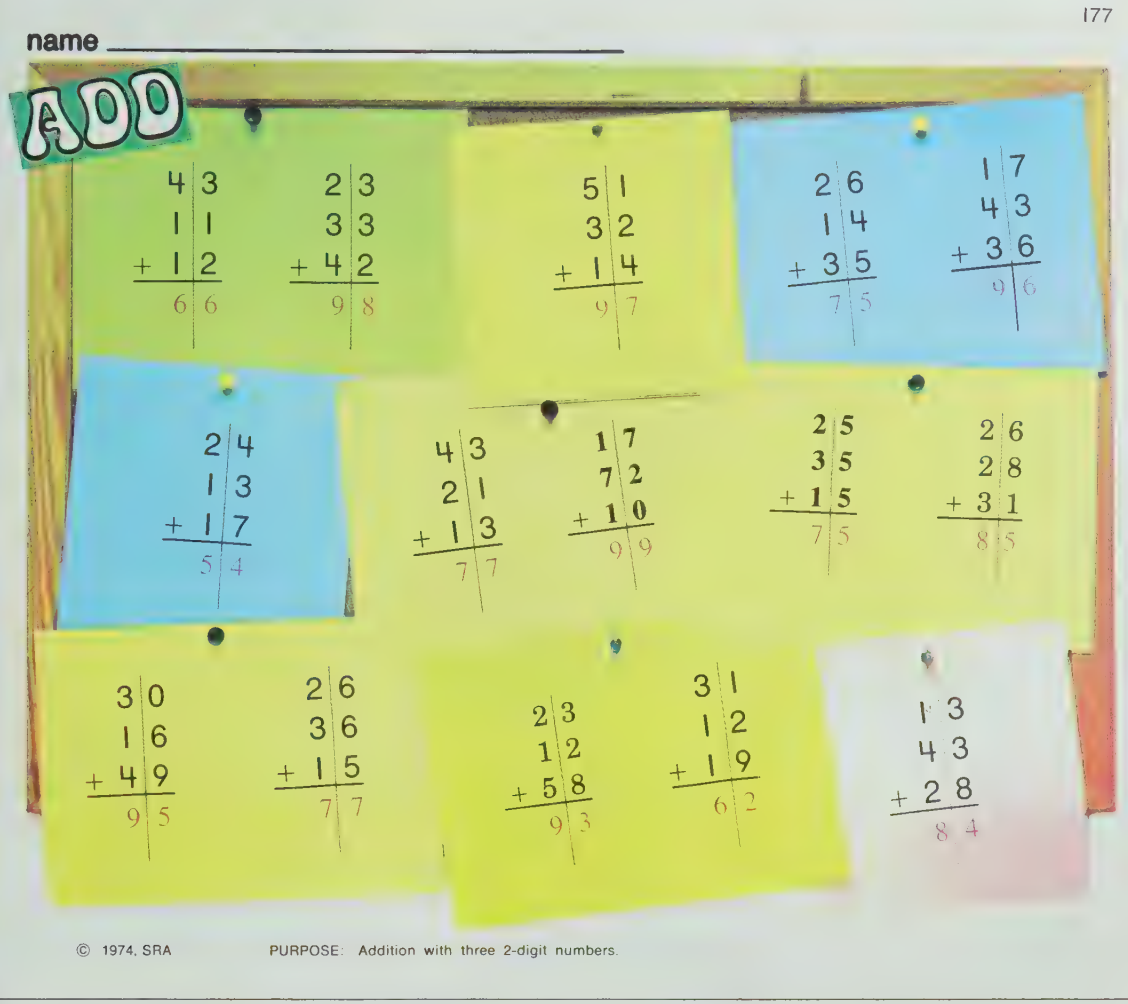
goal Introduction to adding three 2-digit numbers, no renaming

page 176 *Why do you suppose the* **tens-ones** *names are back again?* (To draw attention to adding ones first) *Will you add the tens or ones first?* (Ones)

Have everyone work the first two problems. Check progress. Guide those pupils who need it with questions. *What's the first step? Which two numbers can you add first to make adding easier? How many ones? Is there a ten in the ones? What's the next step? Where do you write that? How many in all?*



PURPOSE: Addition with three 2-digit numbers.



lesson Pages 177, 178

goal Introduction to adding three 2-digit numbers with renaming

warm-up Write this problem on the chalkboard:

$$\begin{array}{r} 23 \\ +\ 39 \\ \hline \end{array}$$

Have the children copy it and find the sum. How many use the short form? Either form is O.K. Have someone come to the board and explain how he did the problem.

Now write this problem on the board for the pupils to copy and complete.

$$\begin{array}{r} 12 \\ 23 \\ +\ 39 \\ \hline \end{array}$$

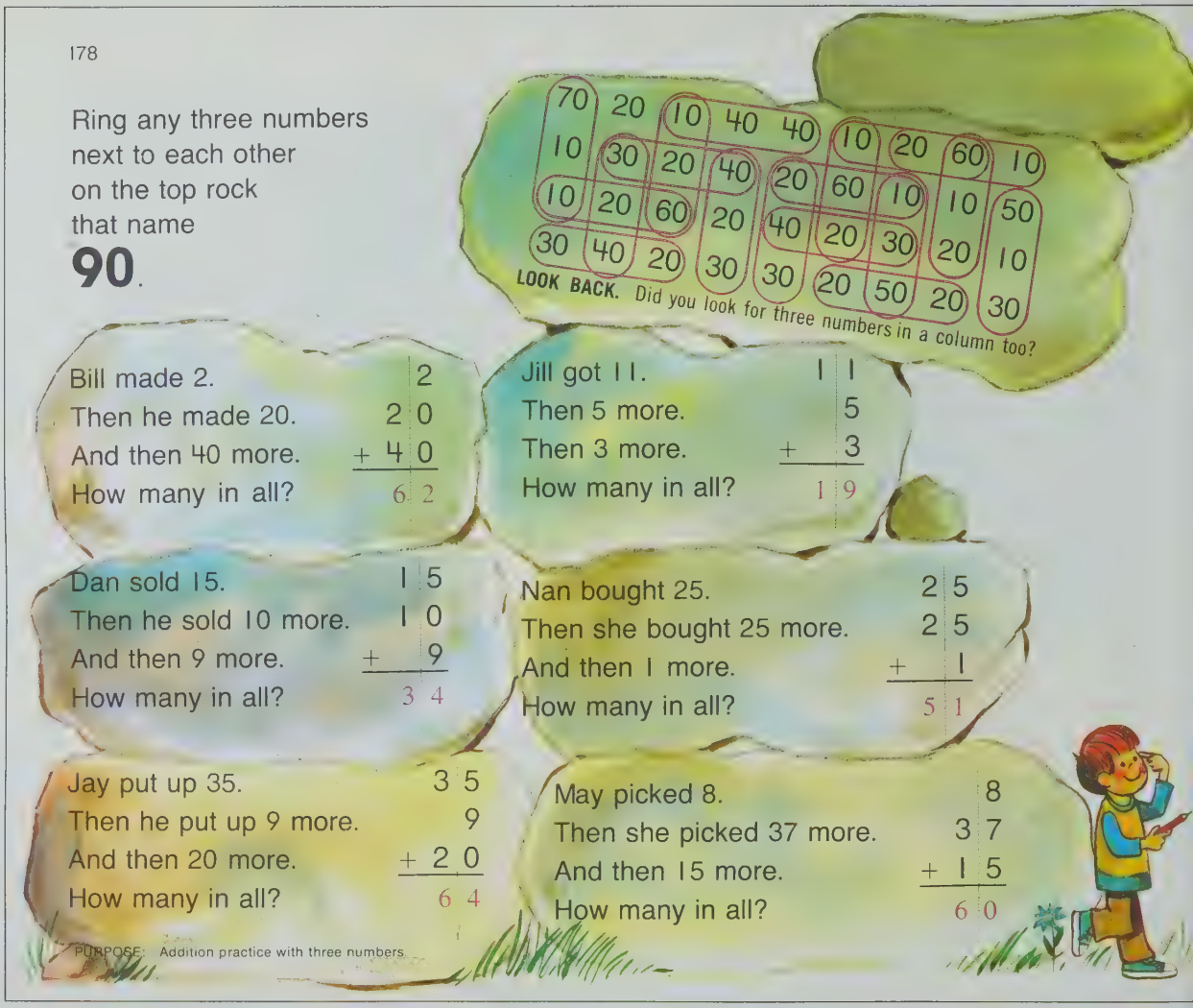
How are the two problems alike? different? Does the same method for finding the answer work for both? Have someone explain how to find the answer. You may want to try another example or two.

page 177 Have everyone complete the first row. Check the results. Watch for errors and correct them before going on.

goal Practice in adding three addends

page 178 Read the directions for the top of the page together. *Look at the first row. Do 70 and 20 work?* (No, directions say 3 numbers.) *Do 70, 10, and 10 work?* (No, numbers are not next to each other.) *Can you find 3 numbers that do work? Can you find 3 more numbers? There are lots of them. You'll really have to think for this problem!*

Check the word problems for words that might be new, and then handle the page the way you think best.


178
Ring any three numbers next to each other on the top rock that name
90.
70 20 10 40 40 10 20 60 10
10 30 20 40 20 60 10 10 50
10 20 60 20 40 20 30 20 10
30 40 20 30 30 20 50 20 30
LOOK BACK. Did you look for three numbers in a column too?
Bill made 2. Then he made 20. And then 40 more. How many in all?
2 + 20 + 40 = 62
Jill got 11. Then 5 more. Then 3 more. How many in all?
11 + 5 + 3 = 19
Dan sold 15. Then he sold 10 more. And then 9 more. How many in all?
15 + 10 + 9 = 34
Nan bought 25. Then she bought 25 more. And then 1 more. How many in all?
25 + 25 + 1 = 51
Jay put up 35. Then he put up 9 more. And then 20 more. How many in all?
35 + 9 + 20 = 64
May picked 8. Then she picked 37 more. And then 15 more. How many in all?
8 + 37 + 15 = 60
PURPOSE: Addition practice with three numbers.

name _____

ADD

tens	ones
4	9
+	7
5	6

tens	ones
2	6
+ 2	5
5	1

tens	ones
2	5
+ 3	8
6	3

5	5
+	9
6	4

tens	ones
1	9
+ 2	4
4	3

7	4
+ 1	8
9	2

3	3
+ 2	9
6	2

5	6
+ 3	3
8	9

2	9
+ 4	2
7	1

2	6
+ 5	8
8	4

4	2
3	7
+ 1	5
9	4

1	3
1	0
+ 1	5
3	8

2	2
1	6
+ 2	3
6	1

3	5
2	2
+ 4	6
10	

1	6
1	4
+ 1	3
4	3

© 1974 SRA

PURPOSE: Checkout—addition with renaming

See activity 5, page 179b.

See activity 6, page 179b.

lesson Page 179

goal **Checkout**—addition of two and three 2-digit numbers with renaming

page 179 The emphasis is definitely on renaming—only two problems do not require this step. Long form or short form? Leave this decision up to each pupil. Accuracy is what's important. Review a few problems together before assigning the page if you feel it necessary for your pupils. Everyone works the page on his own.

Analyze any errors:

- Are certain addition facts the cause?
- Is the pupil confused by a long and a short algorithm?
- Does the pupil automatically rename even when the step is not necessary?

RESOURCES

another form of evaluation

for progress check – page 174

Add.

42 + 7 49	54 + 9 63	63 + 8 71	37 + 6 43
77 + 7 84	29 +34 63	42 +19 61	24 +28 52
16 +64 80	43 +49 92	38 +57 95	19 +23 42

for checkout – page 179

Add.

tens | ones	tens | ones	tens | ones	tens | ones
4 | 6 + | 9 5 | 5	3 | 5 +3 | 7 7 | 2	2 | 7 +3 | 9 6 | 6	6 | 5 + | 8 7 | 3
6 | 7 +1 | 9 8 | 6	4 | 4 +3 | 7 8 | 1	5 | 8 +2 | 3 8 | 1	2 | 4 +5 | 8 8 | 2
1 | 2 1 | 1 +1 | 4 3 | 7	3 | 3 1 | 6 +3 | 2 8 | 1	5 | 2 1 | 6 +2 | 4 9 | 2	4 | 3 2 | 7 +1 | 0 8 | 0

activities

1. things spirit master as shown

Find the answers. Match each answer with a letter to write a message.

6 +5 —	8 +4 —	5 +5 —	9 +4 —
	8 +6 —	9 +9 —	
8 +8 —	7 +8 —	8 +9 —	

Sum	10	11	12	13	14	15	16	17	18
Letter	T	M	A	H	I	U	F	N	S

2. things large numeral cards for 10 through 18; for each player: game board, markers

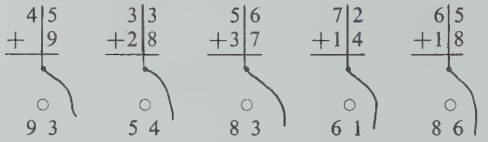
Each player will need a game board as shown. Vary the arrangement and selection of addition facts written on the cards. Focus on sums 10 through 18.

4 + 6	5 + 9	8 + 4	9 + 9
6 + 5	9 + 3	4 + 7	6 + 7
3 + 8	8 + 8	7 + 9	8 + 9
8 + 7	2 + 9	8 + 2	5 + 7

Select a caller. The caller mixes the cards and holds up one at a time for the players to see. Any player who has an addition fact on his game board for which the numeral card shown is the answer covers the fact with a marker. Four markers in a row, column, or diagonal win.

3. things At least 5 colors of yarn; crayons, pencils, or pens to match the colors of yarn; tagboard cards

Write one problem on the card for each color of yarn.



Attach a piece of yarn in each answer position. Write the answers in random order along the bottom. Make a hole above each answer large enough for the yarn to pass through easily.

Turn the card over. Color code each hole so that the color around the hole will match the color of yarn when the yarn is pushed through the correct answer hole. This is a self-corrective activity.

4. things egg carton with lid attached, 2 sugar or sponge cubes, felt pen

Write a 1-digit numeral in each cup of the egg carton. Label the faces of one cube with the numerals 0 through 5 and the faces of the second cube with numerals 4 through 9.

The 2 cubes are placed in the carton, the lid is closed, and the carton is shaken. When the carton is opened, the pupil makes up a 2-digit number by using the digit that lands faceup on a cube and the digit in the cup in which the cube lands. For example, when a cube lands with 5 faceup in the cup labeled 7, the pupil may decide on 75 or 57. Two cubes—two 2-digit numbers. The numbers are then added. Points are earned for correct answers as follows:

- Problems with renaming—2 points
- Problems without renaming—1 point

Pupils work in pairs so that they can check each other's answers. The pupil with the most points wins.

5. things for each group: numeral cards for 0 through 50, container, paper and pencil

Pupils work in small groups. The cards are placed in the container. Each player draws a card to begin and writes its number on his paper. The players now take turns drawing a card and adding the number on the card to the number already on their paper. Players check each other's answers. If the answer is correct, the player crosses out the two numbers added, leaving only the answer. If the answer is wrong, the player crosses out the answer and the second number drawn, leaving only the original number. Play continues until someone reaches 100.

6. things small cards, 4 envelopes, game board, markers

Label the 4 envelopes—single, double, triple, home run. Prepare a set of cards, one problem per card, for each envelope as follows:

- Single—addition of columns of three 1-digit numbers
- Double—addition of two 2-digit numbers, no renaming
- Triple—addition of 2-digit numbers with renaming
- Home run—addition of three 2-digit numbers

Make a baseball-diamond game board. Form two teams. The game is played according to baseball rules for scoring. The first batter up selects a problem of whatever type he wants. For a right answer, he may place his marker appropriately. A wrong answer is an out. Three outs and the opposing team comes to bat.

additional learning aids

operation—chapter objectives 1 and 2

SRA products

Arithmetic Fact Kit, SRA (1969)
Addition cards: 27–29
Computapes, SRA (1972)
Module 2, Lessons: AS 21, 22, 23
Mathematics Involvement Program, SRA (1971)
Cards: 133, 153, 383
Skill through Patterns, level 2, SRA (1974)
Spirit masters: 16, 28, 29, 31, 34, 35, 36
Visual Approach to Mathematics, level 2, SRA (1967)
Visual: 10

letter to parents

Dear Parents:

It's easy to make assumptions about how much a child knows about money. I can't guarantee that every child in the class will spend money wisely, but I think you will see that your child knows all of the coins and their value at the end of the next study unit. He will have also had some good experience in counting change.

When we go back to the study of subtraction, we will be renaming as promised. We'll use real objects again so that your child can prove to himself that renaming is necessary. Working with objects will also give a much greater insight into all those extra marks that have to be made in a subtraction problem that requires renaming. I want to ask you a special favor again. Please wait until after your child brings home pages from his book before you get involved. We will be using a very simple approach that may appear terribly slow to you, but now is a good time to go slowly. If your child understands every single step in subtraction, tackling subtraction with larger numbers that need lots of renaming won't be hard at all.

After all the hard work with subtraction we'll explore fractions. I hope that when we finish there won't be any arguments about who has the bigger half. The main goal of the study is simply to get acquainted with what a fractional part is and the way that this special number can be written. Maybe your child can help read a recipe at the end of our study.

I hope you are as proud of our progress as I am. Thank you again for your interest and help.

9 MONEY

before this chapter the learner has —

1. Identified pennies, nickels, dimes, and quarters and told the value of each coin
2. Counted from a number to a number
3. Compared two 2-digit numbers

in chapter 9 the learner is —

1. Naming the value for a set of coins less than or equal to a dollar
2. Naming the value for a set of coins and bills less than $5
3. Counting change
4. Mastering naming the value for a display of a dollar and a set of coins (not to exceed a dollar)

in later levels the learner will —

Compute with money notation

Notes & Things

Most youngsters know a surprising number of facts about money. Most have handled money in buying candy and pencils, and maybe some children have learned about saving money. This chapter builds on these experiences. But please watch for the youngster who still may be willing to trade 3 quarters for a dollar bill or the youngster who will accept 10 nickels as fair exchange for 10 dimes.

This is an exploratory chapter. There are lots of good problem-solving situations that everyone will enjoy. Don't forget all the good addition and subtraction practice the youngsters will have. You may discover some children who make careless errors in straight computation practice but suddenly will perform with 100 percent accuracy when money is involved.

words

Concept-development words introduced in this chapter are listed below. The word appearing on the pupil page is marked with an *.

decimal point
change*

things

real money—dollar bill, silver dollar, half dollar, quarter, dime, nickel, penny
play money—coins, dollar bill

For the extra activities you will want to have food ads available.

lesson Page 180

goal **Survey**—telling the value of a set of coins

things real money—quarter, dime, nickel, penny

page 180 Use this page to determine how familiar your pupils are with the various coins and the value of each coin. *What is the girl doing? Where is she?* (In a bank) *What do you think she is going to do?* (Make a deposit) *What* **coins** *could she have?* Hope that the group will say pennies, nickels, dimes, and quarters. Ask for the value of each. Does anyone suggest a half dollar or a silver dollar? GREAT!

That will be a source of more good discussion. Have the youngsters match the real coin with the picture. Read the question aloud. *If the girl has 4 quarters, 5 dimes, 5 nickels, and 5 pennies, can you figure out how much money she has in all?* Have everyone try to count the set of coins. *How much did you count?* Count together to find the correct answer. *What's another name for 180 cents? What could you buy for $1.80?* Talk about how the coins can be counted.

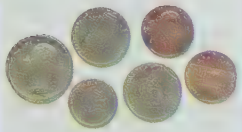
Relate the discussion to the pupils' experiences. *Do you save money? What do you save your money in? What do you plan to do with the money you are saving? Is saving money a good idea? Why? How do you earn your money?*

The ease and the accuracy with which your pupils are able to identify and count the coins will signal whether some prebook coin-counting sessions are necessary.

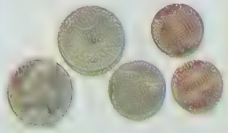
You may want to set up a banking system for your classroom. As money is withdrawn from the bank for the various activities in the chapter, it will have to be counted. Then it must be checked back into the bank when the activity is finished. Lots of counting will be involved.

181

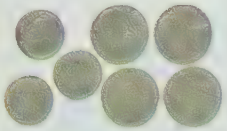
name _____



You have 47 ¢



I have 57 ¢

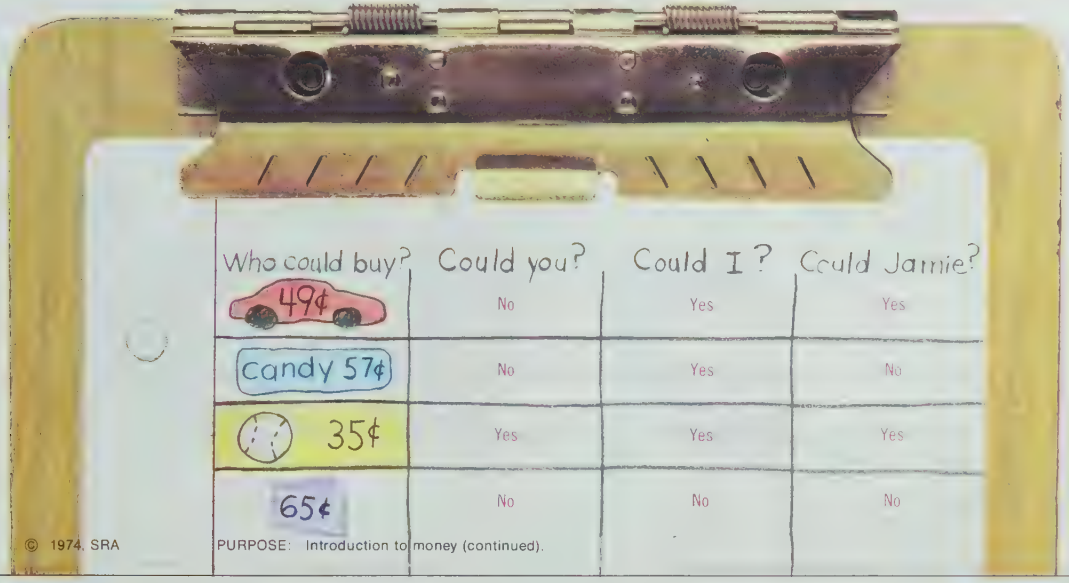


Jamie has 50 ¢

Who has the most money?

I do.

Write "yes" or "no" to complete the table.



Who could buy?	Could you?	Could I?	Could Jamie?
49¢	No	Yes	Yes
candy 57¢	No	Yes	No
35¢	Yes	Yes	Yes
65¢	No	No	No

© 1974, SRA

PURPOSE: Introduction to money (continued).

lesson Pages 181, 182, 183

goal Counting and comparing the value of sets of coins

memo Make sure everyone knows what the symbol ¢ means.

things real money or play money

warm-up Group the pupils. Supply each group with a set of coins less than $1. *Make a set of a quarter, a dime, 2 nickels, and 3 pennies. How much do you have? How did you count the money?* Practice counting other sets of coins. Then switch the emphasis. *Make a set that is worth 27 cents. What coins did you use?* Count the various collections to be sure each equals 27 cents.

page 181 *Find out how much you have, I have, and Jamie has.* Have everyone count on his own first, then count together to check the amounts. Lead the youngsters to begin with the coin that has the greatest value. These answers are important for completing the page.

Work the first row of the table as a group, then you'll know how to group the children. With those who need help, make up the three sets of coins shown. Have them actually try to make each purchase. *Do you have enough money? Will you have some money left? Do you need more money?*

goal Identifying equal amounts of money

things real coins

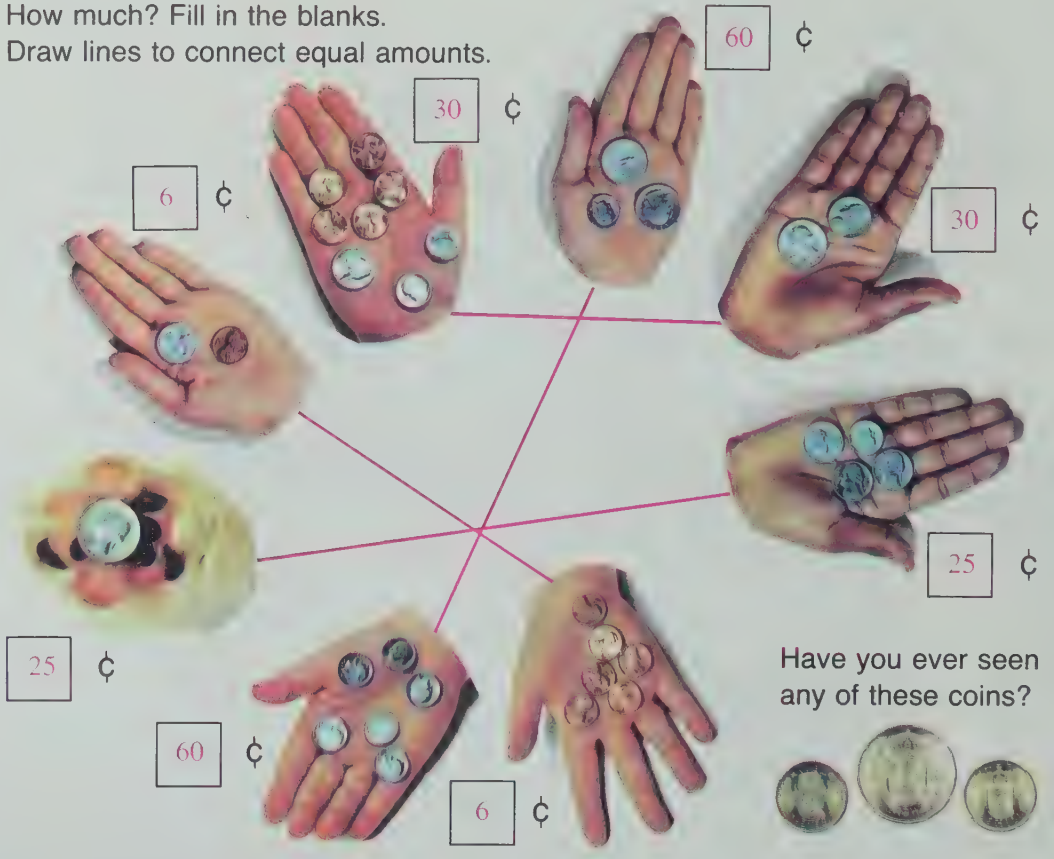
warm-up Continue the practice in counting real money. Have a child name an amount less than a dollar and have everyone count out that amount. Is more than one combination of coins possible? Examine the various combinations. Count each set to be sure.

page 182 Read the directions together. Find at least two sets that show the same amount. Have the blanks filled in and the line drawn so that everyone will understand the directions. Determine whether any difficulty results from not knowing the value of the coins or from computing mentally.

The exact exchange value of the British coins shown will vary with the value of the United States dollar. This is pretty sophisticated for youngsters of this age. It is enough for them to know that each coin has a name and has an approximate value.

182

How much? Fill in the blanks.
Draw lines to connect equal amounts.



PURPOSE: Identifying equal amounts of money.

just for fun: Supply the missing numerals.

A penny is ____ cent.
A lollipop and it's spent.

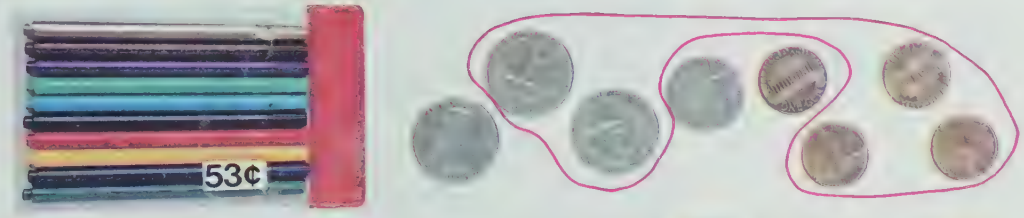
Five pennies for ____ nickel,
But please don't buy a pickle.

____ nickels for a dime,
Or take ____ pennies this time.

It's ____ pennies for her,
For you it may be a quarter.
It is a nickel and ____ dimes for me,
But ____ cents it will always be.

name _____

Ring the coins you would need to pay.



Have you ever seen any of these coins?

© 1974, SRA

PURPOSE: Identifying the coins needed for payment.

goal Showing a specific amount of money with coins

things real or play coins

warm-up Attach price tags (less than $1) to objects in the room. Group the youngsters. Provide each group with 2 or 3 objects and a set of coins. Have each group show the coins needed to pay for each object. When they are counting money, encourage them to start with the coin having the most value and count from that number. If your pupils have little or no experience with money, they will need lots of practice.

page 183 The warm-up leads right into the page. Read the directions together. Everyone works on his own. Discuss the results.

Mexican coins are pictured at the bottom of the page. The first coin is a 5-centavo piece; the next is a 10-centavo piece; the next is a centavo; and the last is a peso. 100 centavos would buy the same amount of anything as 1 peso. Let the children think about these 100 coins and pretend they are holding them. Then tell them that 100 centavos would buy only 1 package of gum in the United States. (1 peso has about the same value as 8 cents in U. S. currency.)

lesson Pages 184, 185, 186

goal Showing one dollar with coins

things real or play money:
coins
dollar bill
real silver dollars

page 184 Show a dollar bill. *Can you tell me what this is? How much is a dollar worth? What will it buy? How do we write one dollar?* Introduce the symbol for dollar ($).

A group of coins can be worth a dollar. Count the first set of coins. Are these coins worth a dollar? Continue down the page. When you get to the third set, count it. *That's not a dollar! Two quarters—that's 50 cents. How many dimes do you need to make a dollar?* Hand a child 2 quarters. Have him add enough dimes to the set to make a dollar. *How many dimes?* Count the entire set to be sure it equals a dollar. Use the same technique for the remaining problems.

Try to obtain a real silver dollar—perhaps even dollars from different issues. Match it with the silver dollar shown. *Are the pictures on the face the same?* Compare the size. What is shown on the other side?

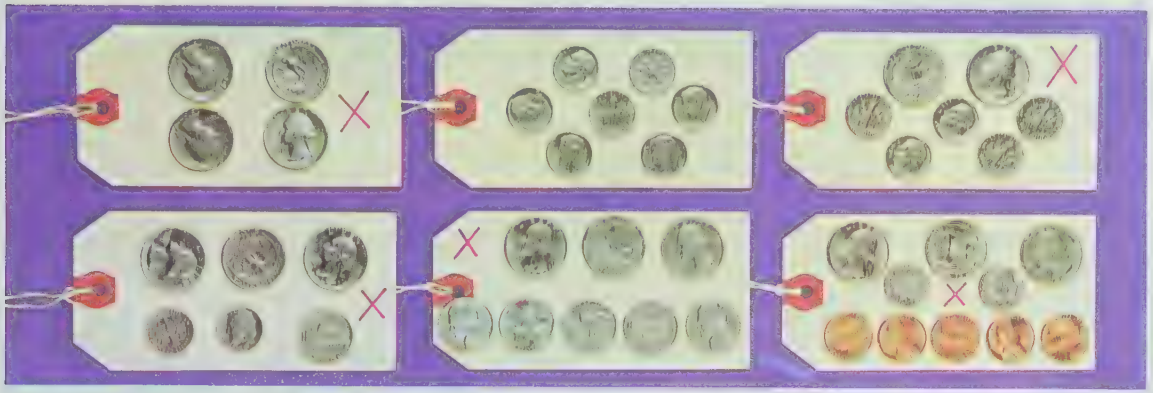
184

Fill in the blanks.

PURPOSE: Making one dollar in change.

name _____

Mark which set of coins you could exchange for a one-dollar bill.



Sometimes prices are marked like this: 25¢

Sometimes they are marked like this: $.25

Do these two tags tell the same amount? Yes

If you had 100 pennies, could you buy something that cost $1.00? Yes

If you had 10 dimes, could you buy something that cost $1.00? Yes

If you had 4 quarters, could you buy something that cost $1.00? Yes

© 1974, SRA PURPOSE: Making change for a dollar.

goal Practice in identifying sets of coins that equal a dollar

things real or play coins

warm-up Group the youngsters. Provide each with a set of coins. *Make as many different sets as you can that are equal to a dollar.* Share the results. Record the information found on a chart.

$1 is the same as:
100 pennies
20 nickels
10 dimes
4 quarters
2 quarters 5 dimes

page 185 Read the directions for the sets of coins together. Decide how the sets are to be marked. This part of the page should be completed independently. To check, count the sets together.

Talk about the two ways of writing cents.

Everyone, keep your eyes open. Try to find examples of each kind of price tag and bring them to school.

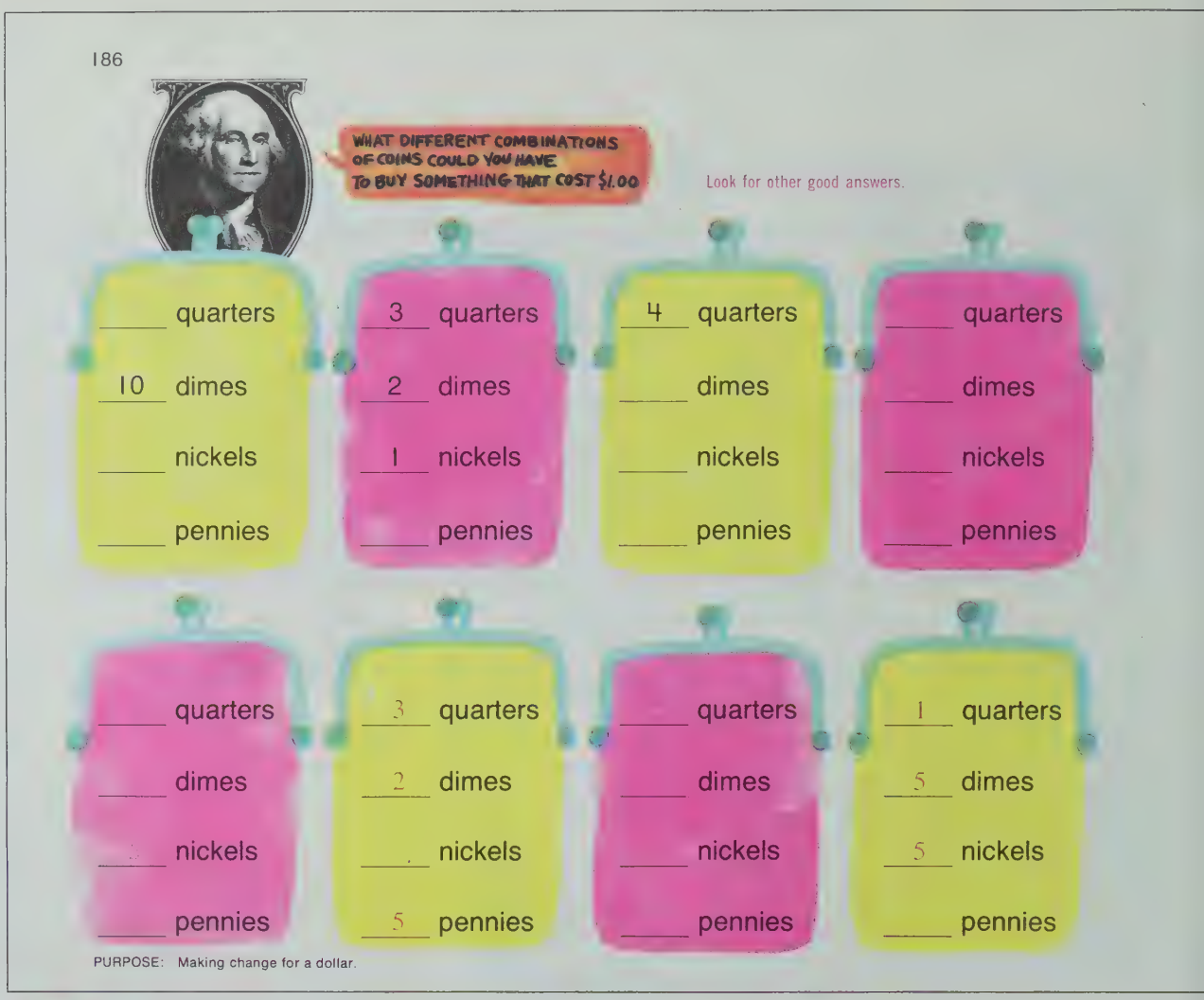
Does anyone need help with reading words so that he can finish the page?

goal Practice in naming sets of coins that equal a dollar

memo The performance of your pupils so far should tell you whether more practice sessions with coins are needed or your pupils are ready to go on.

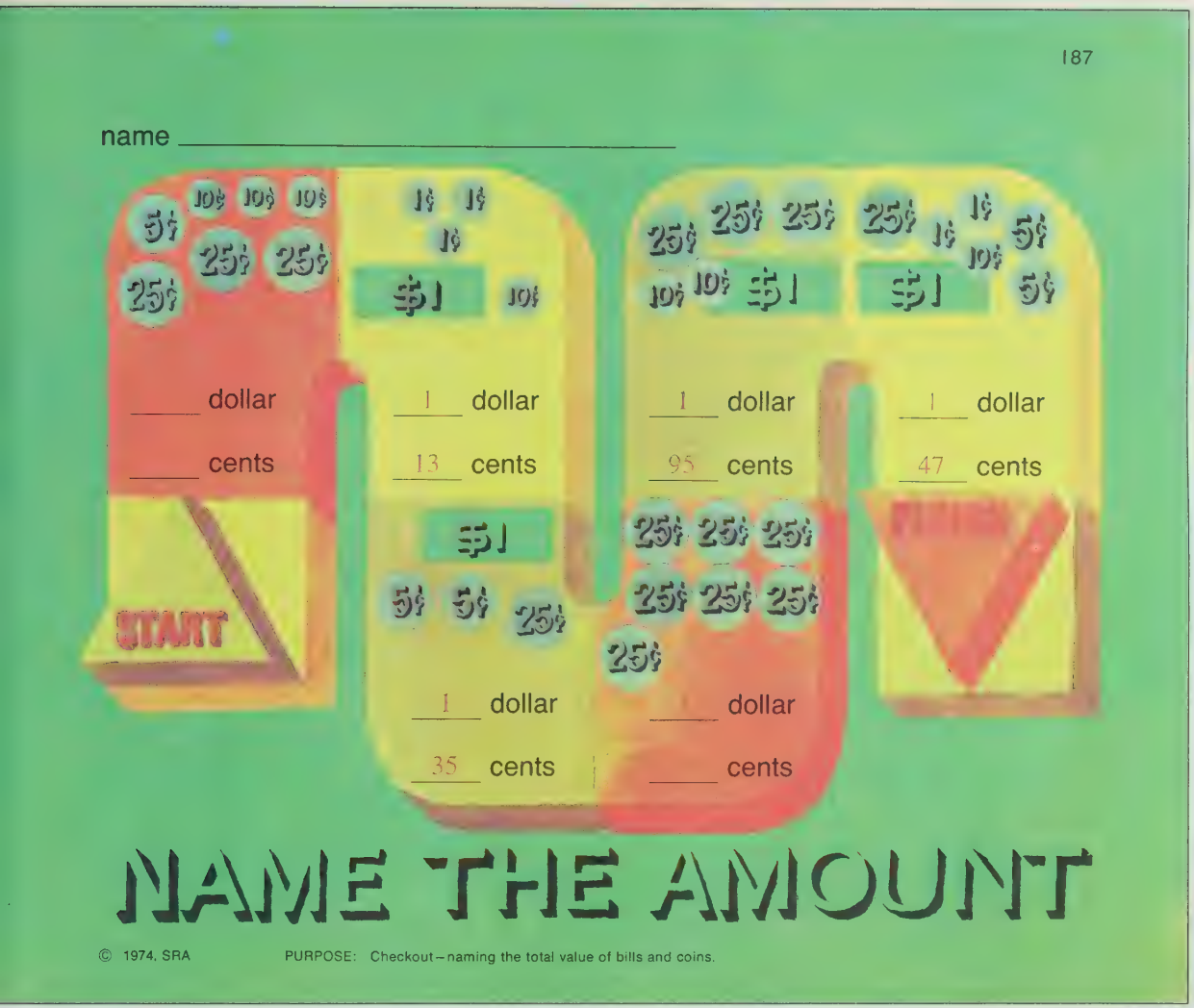
things real or play coins

page 186 Go over the directions. Work 1 or 2 examples together. Some children may still need real or play money for counting. When all have finished, have the youngsters share their money. How many different combinations did they find?



things real or play money

Provide each pupil in the group with some real or play money. Select a capable banker. Provide the banker with additional coins and some dollar bills. Each person is given an opportunity to ask the banker to exchange coins for others with the same value—provided a correct coin is asked for. Example: *I have five pennies. May I have a nickel in exchange for my five pennies?* The group listens for errors. If someone detects an error, a hand goes up. The banker then asks what the question should be.



lesson Pages 187, 188, 189

goal Naming the value of a set of money worth less than two dollars

things flannel board
felt models of coins
and a dollar bill

warm-up Time for some oral counting. Count by 25s to 100. Count from 25 by 10s and by 5s. Count from 50 by 10s and by 5s. Count from 75 by 10s and by 5s.

Display a set of money on the flannel board. Review the fastest way to find the total value—counting from the greatest value to the least. Practice counting various combinations.

page 187 This is a wild page. If you have been working only with real money, make sure all children can interpret the pictured coins. Also make sure they know that each problem is in a different color block. *What will you do on this page?* Talk about how to record the value of each set. The children should work independently. To check, have a child count each set aloud. Listen for the method each one uses.

goal Introduction to recording amounts of money with dollar-and-cent notation

memo Did the youngsters bring in any samples of price tags? The experience of having read those tags will pay off now.

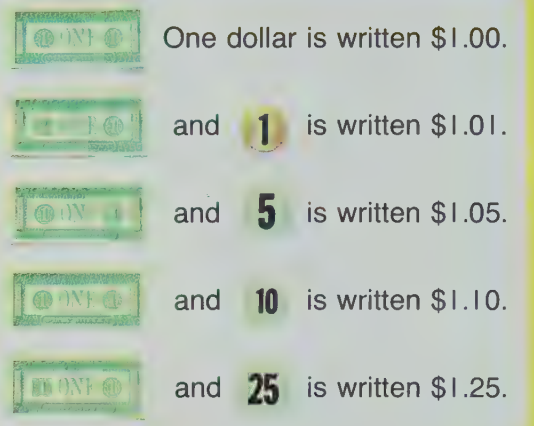
page 188 Everyone together for the first part of the page. Write the following on the chalkboard:

Examine the first picture. *One dollar. How many cents?* Have someone fill in the blanks on the board. Below the display write $1.00. *This is the way we usually write one dollar. Point to the dollar symbol. What does this stand for?* Point to the decimal. *This is a decimal point. It separates the dollars and cents. The 1 tells how many dollars. The two zeros tell how many cents.* Use the ___ dollars ___ cents form to explain how each amount is written through $1.25. Did anyone notice that two digits are always used to show cents? If not, ask a question about this. Be sure to explore the role of the zero—$1.00, $1.10, $1.01.

Have everyone write the first total. Check by having someone write how much on the board. *Does anyone disagree?* Continue through the first three problems. To check, have each amount written on the chalkboard and ask if everyone agrees. Finish the page. Maybe everybody got every one correct.

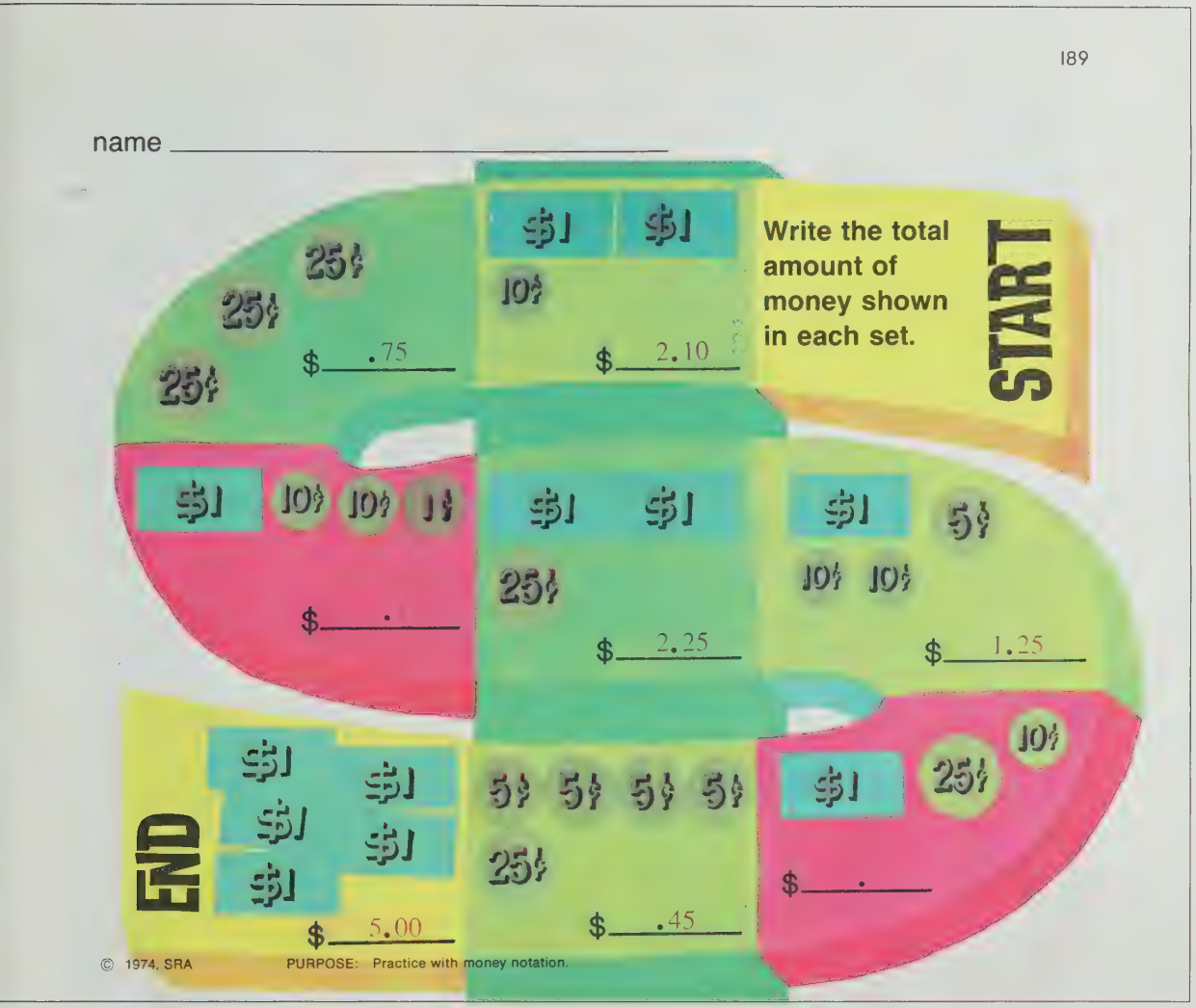
Be sure to **praise progress.**

188



Write the total.

PURPOSE: Writing dollar-and-cents notation.



goal Practice in recording amounts of money with dollar-and-cent notation

things flannel board felt models of coins and dollar bills

warm-up Display a dollar and a quarter on the flannel board. *How much is that? How do you write that amount?* Have the answer written on the board. If help is needed, guide by questions. *How do you show a dollar? What separates dollars from cents? How many cents?* Continue with examples until dollar-and-cent notation is being used with confidence.

page 189 This art may need explaining just as on page 187. Each problem is in a different color.

After the warm-up there should be no trouble with the page. Counting the amount of money is one skill; using dollar-and-cent notation to record that amount is another. If a pupil does have trouble, determine which skill he needs help with.

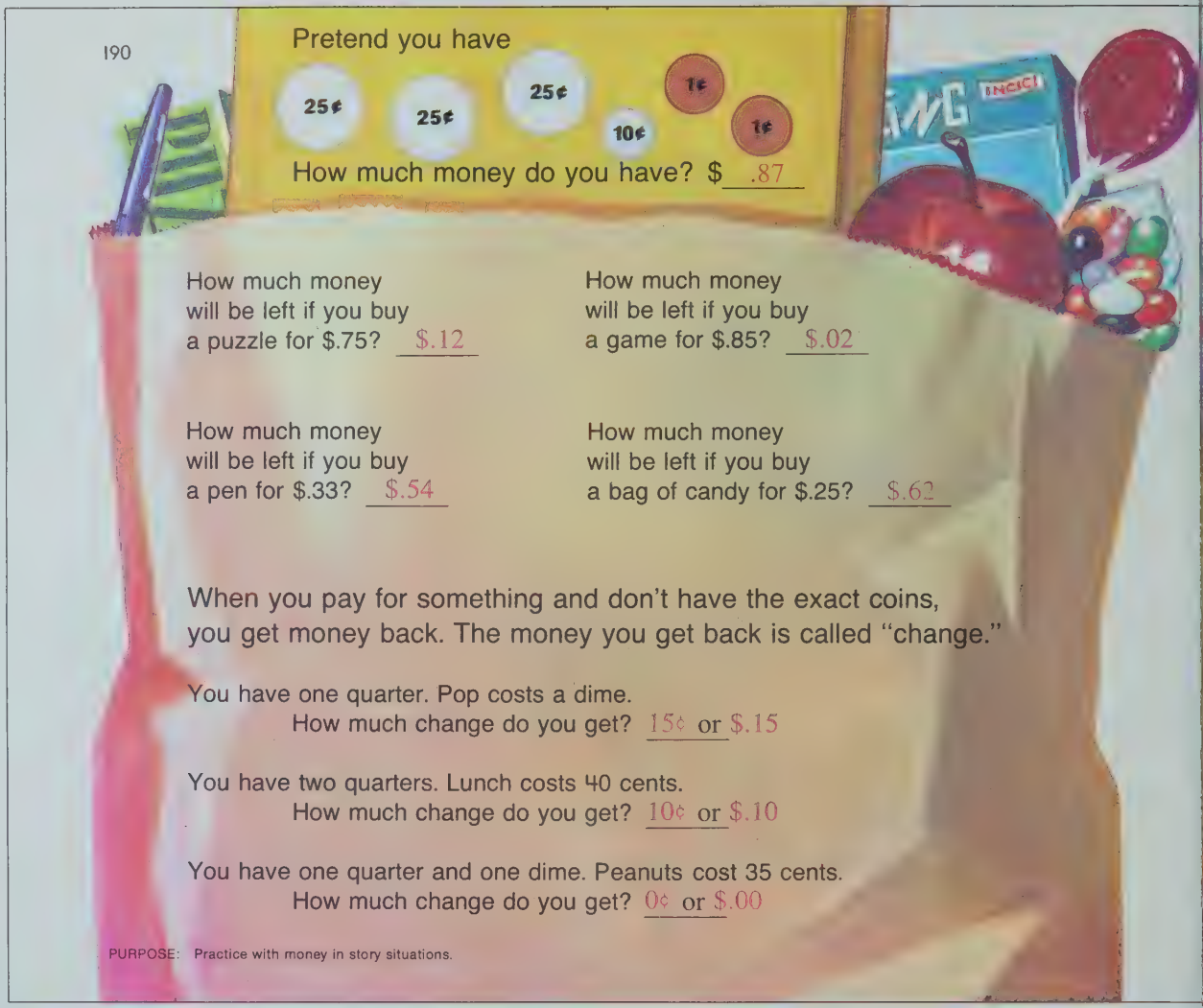
lesson Pages 190, 191

goal Finding the amount of change

memo The skill of making change is extremely important. The number of people who have never learned how is surprising. The skill does not involve the ability to subtract; it involves the ability to count from a number to a number, using either the fewest number of coins or those that are available.

things real or play coins

page 190 This page may take more than one day, depending on the experiences your pupils have had with money. Work together. Have coins available so that each answer can be checked. Stress counting from the amount spent to 87 cents. Is there more than one way to count? Is the amount of change always the same? For example, when counting the change after buying the puzzle, one pupil might count: 75 cents and a nickel make 80, and a nickel makes 85, and 2 pennies make 87 cents. Another might begin with 75 cents and count a dime and 2 pennies. Either way is O.K.


190
Pretend you have
25¢
25¢
25¢
10¢
1¢
1¢
How much money do you have? $ .87
How much money will be left if you buy a puzzle for $.75? $.12
How much money will be left if you buy a game for $.85? $.02
How much money will be left if you buy a pen for $.33? $.54
How much money will be left if you buy a bag of candy for $.25? $.62
When you pay for something and don't have the exact coins, you get money back. The money you get back is called "change."
You have one quarter. Pop costs a dime.
How much change do you get? 15¢ or $.15
You have two quarters. Lunch costs 40 cents.
How much change do you get? 10¢ or $.10
You have one quarter and one dime. Peanuts cost 35 cents.
How much change do you get? 0¢ or $.00
PURPOSE: Practice with money in story situations.

Ask the children to bring in food ads. Let them compare prices for such items as milk, eggs, catsup—whatever items are being featured. Now have them list the item and record the highest and the lowest price for each. Save these lists and ads for activity 2, page 192a.

goal Practice in finding the amount of change for a purchase

things real or play coins
half dollar

page 191 Use the same procedure as with page 190. Making change is an important skill and well worth the time.

Talk about the coin shown. *How much is it worth? What is the coin called? Do any of you have one of these coins? What could you buy with a half dollar? What coins could you exchange for a half dollar?* (two quarters, and so on)

lesson Page 192

goal Solving special problems with money; **Checkout**— money

things real money

page 192 Remember the last time you needed to call from a pay telephone only to find out, after searching through a purse full of change, that you couldn't make that call because you didn't have a dime or two nickels? Children need to understand, especially in this machine age, that sometimes the money they have will not buy what they want. This should be your emphasis on this page.

Do work together. Go in slow, easy steps. This is an important concept.

The checkout for this chapter must be administered on a one-to-one basis. Display some real money for the child. Include a dollar bill and coins whose value is less than a dollar. Point to a coin. Ask what the coin is called and its value. Then have the child tell you the total value of the money displayed. Change the display for the next youngster. Pupil responses will tell you who needs more experiences. Determine whether the pupil's problem is not knowing the value of a specific coin or not counting (adding) the total correctly.

192

Have you ever had any money?
Let's say you had a dime.
You passed this machine and thought,
That gum would sure taste fine.

After all, you do have money—
A bright, new, shiny dime.
But the machine doesn't care—
It takes only one penny at a time.

What would you have to do
to get some gum?
Change the dime to pennies.

Now pretend you have . . .

1 dime and 1 penny.
You want to buy gum for
your friend and you.

Can you get 2?

What do you have to do?
Change the dime to pennies.
If you bought 2,
how much money
would you have left? 9 ¢

You have 1 dime and 2 pennies.
Four of you want a gumball.

Can you get 4? No

What do you have to do?
Change the dime to pennies.
How much money would you have left? 8 ¢

You have 1 dime and 3 pennies.
Six of you want a gumball.

Can you get 6? No

What do you have to do?
Change the dime to pennies.
How much money would you have left? 7 ¢

PURPOSE: Solving special problems with money.

See activity 1, page 192a.

See activity 2, page 192a.

RESOURCES

activities

1. things play money, small envelopes

Label each envelope with a letter of the alphabet. Place a set of coins in each envelope and include a dollar bill in some. Have the pupils write the letters used on the envelopes in a list on their papers. Pass out the envelopes. Each person counts the amount of money in his envelope and records the amount on his list next to the appropriate letter. The coins are returned to the envelopes, which can be exchanged for more practice. No fair changing the amount in any envelope! You'll want to keep a master list so that answers can be checked quickly.

2. things ads and list from the activity on page 190

Use the food list from the activity on page 190 to make a chart as shown. Have the children **count** from the lowest price to the highest to find the amount of money saved. This will avoid the need to subtract with renaming.

Food	Low	High	Saved
eggs	79¢	84¢	5¢

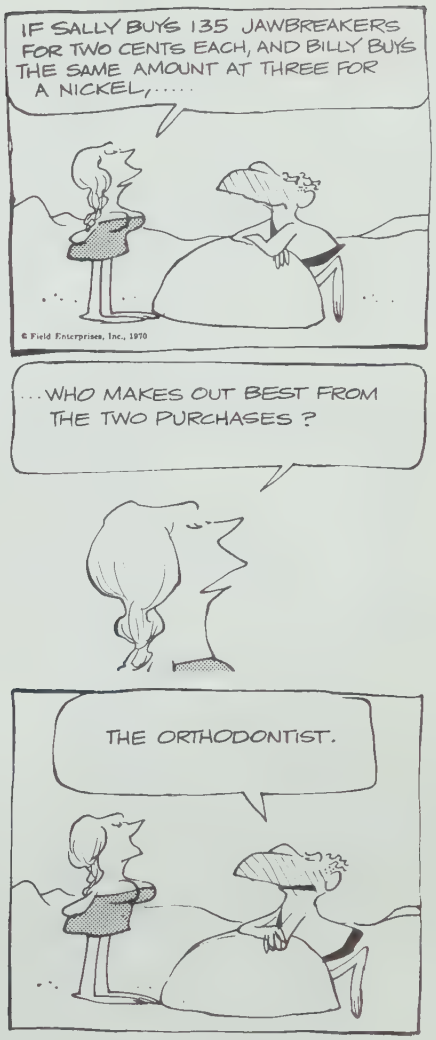
additional learning aids

concept—chapter objectives 1, 2, 3, and 4

SRA products

Inquisitive Games: Exploring Numbers and Space, SRA (1967)
Buy and Sell Game II
Skill through Patterns, level 2, SRA (1974)
Spirit master: 33

other learning aids (described on page 256i)—Flannel Money Pieces, Pay the Cashier Game


IF SALLY BUYS 135 JAWBREAKERS FOR TWO CENTS EACH, AND BILLY BUYS THE SAME AMOUNT AT THREE FOR A NICKEL,.....
© Field Enterprises, Inc., 1970
...WHO MAKES OUT BEST FROM THE TWO PURCHASES ?
THE ORTHODONTIST.

By permission of John Hart and Field Enterprises, Inc. © 1970

Drawing cartoons is fun. Who can finish these?

I have 5 coins.

I have 1 coin.

You guys have the same amount of money!

Put coins in the hands to make the story true.

I have 4 coins.

I have 10 coins.

You gals have the same amount of money.

© 1974, SRA Permission to reproduce for school use.

10 SUBTRACTION WITH RENAMING

before this chapter the learner has —

1. Mastered the subtraction facts
2. Subtracted 2-digit numbers, no renaming
3. Identified situations in which subtraction was not possible
4. Grouped 10 ones as 1 ten
5. Found many names for a number

in chapter 10 the learner is —

1. Reviewing the subtraction facts
2. Reviewing subtraction, no renaming
3. Developing the renaming of numbers as a skill
4. Subtracting 2-digit numbers with renaming
5. Solving word problems that involve subtraction

in later chapters the learner will —

1. Master subtracting 2-digit numbers with renaming
2. Extend subtraction to 3-digit numbers

Notes & Things

Subtraction with renaming can be understood and successfully mastered by every child IF he or she knows the subtraction facts and IF he or she has enough time to explore the action of subtracting, using manipulatives.

The first year of prepublication study with this program revealed two interesting and surprising subtraction-error patterns in pupils' work in level 3 and level 4. The first error pattern was easy to identify. Here are three examples of it.

56	151	320
−38	− 63	−119
22	112	119

The youngsters reversed the digits to be subtracted instead of computing after the necessary renaming. Perhaps the excessive practice with the commutative property of addition was partly to blame; perhaps the individual children simply never had taken time to think about what subtraction is really all about. The only constructive course of action was to prepare a chapter that prevents such an error from happening in the first place. Pages such as 196 should help, and the dramatic approach to the need for renaming on pages 200 and 201 will also do its share.

Please make sure to have the ten-trays on hand. The action of dumping a ten-tray appeals to the children and accurately shows what happens to the number of tens and the number of ones the ten-tray contained.

Renaming numbers is a skill in itself that requires isolated practice. The subtraction of ones should not be started until the renaming step is completed. If you insist that the renaming be completed first, you will help prevent the second common subtraction-error pattern that was found in the later levels. Here are examples of the second most frequent error:

$5\overset{12}{\cancel{2}}$	$12\overset{13}{\cancel{3}}$	$57\overset{10}{\cancel{0}}$
−24	− 65	−125
38	68	655

(The third common error also was identified. Would you believe that if youngsters have a bunch of problems to do and the first several require renaming, often they are carried away and rename numbers that don't have to be renamed.
Oh goodness!)

Your job in this chapter is much easier said than done. Get every child to master the subtraction facts: let every child spend as much time as he needs with the ten-trays; request that the renaming be completed before the child finds how many ones remain, then how many tens remain.

If you get this job done, you really deserve congratulations. Your reward will be the computational proficiency you will see in every one of your pupils.

words

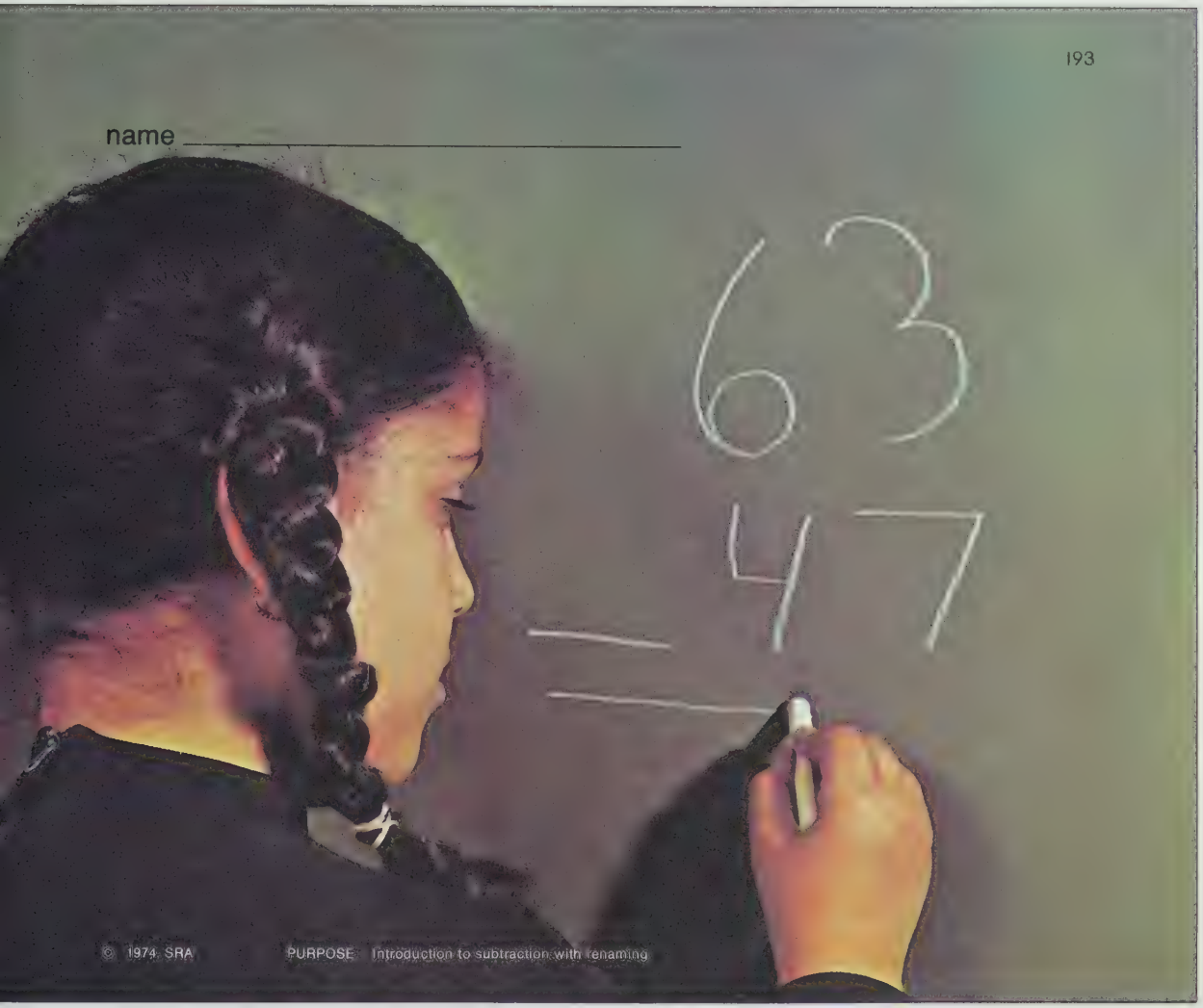
The concept-development word *rename* is introduced in the chapter and appears on the pupil page.

things

ten-trays
counters
crayons

For the extra activities you will want to have these things available:

- subtraction flash cards
- 24-bottle wood case
- adhesive tape
- egg timer or stopwatch
- wood or sugar cubes
- paper for game boards
- box
- tagboard for problem cards
- index cards



lesson Page 193

goal **Survey**—subtraction of two 2-digit numbers with renaming

memo This page will help you identify pupils who already know something about subtraction with renaming and may be capable of moving more quickly through this chapter.

page 193 *That problem looks hard. Do you think the girl will be able to find the answer for the problem? Can any of you find the answer?* Let the children talk about, and even illustrate, how the problem might be solved. No suggestions! It's all right if no one can come up with a solution. Finding the answer for problems like these is the learning goal for this chapter.

lesson Pages 194, 195

goal Review of subtraction facts

memo Subtraction facts are a necessary tool for subtraction with renaming. Quickly identify the pupils who need help with the concept of subtraction and practice with the facts. Set aside a few minutes each day for drill until mastery is achieved.

page 194 *You're being asked a question. What's the question?* Have pupil show with objects in the room that he remembers what subtraction means. *Does subtraction tell how many in all? What can the answer tell?* (How many remain) Review a few examples. Oral answers are fine.

Emphasize accuracy, not speed, for the present. Work for speed later. It's been a while since the children have used subtraction facts. Pupils who have not memorized or have forgotten the facts may need counters.

194

Do you remember subtraction? TIME OUT to make sure.

5 − 0 = 5	4 − 3 = 1	3 − 1 = 2	6 − 4 = 2	9 − 3 = 6	8 − 2 = 6	5 − 2 = 3
4 − 2 = 2	8 − 3 = 5	10 − 4 = 6	9 − 0 = 9	3 − 2 = 1	0 − 0 = 0	2 − 0 = 2
7 − 4 = 3	6 − 2 = 4	8 − 4 = 4	7 − 6 = 1	6 − 3 = 3	9 − 1 = 8	6 − 6 = 0
8 − 0 = 8	10 − 3 = 7	11 − 8 = 3	12 − 4 = 8	14 − 9 = 5	10 − 8 = 2	15 − 6 = 9
12 − 7 = 5	16 − 7 = 9	11 − 4 = 7	15 − 7 = 8	12 − 8 = 4	13 − 4 = 9	16 − 8 = 8

Do you need more practice?

PURPOSE: Review of subtraction facts.

things subtraction flash cards

The players form a circle. One player is chosen to be a jet plane. He stands behind a player. Someone is chosen to show one flash card at a time. If the "jet plane" answers correctly first, the plane moves behind the next player. If the player answers correctly first, he becomes the jet plane.

name _____

If you forget 11 − 3 = 8, think ? + 3 = 11.

If you forget 16 − 9 = 7, think ? + 9 = 16.

Let addition help you with these subtraction facts.

13 − 6 = 7 ? + 6 = 13	10 − 7 = 3 ? + 7 = 10	11 − 4 = 7 ? + 4 = 11
13 − 9 = 4 ? + 9 = 13	18 − 9 = 9 ? + 9 = 18	12 − 8 = 4 ? + 8 = 12
13 − 7 = 6 ? + 7 = 13	11 − 8 = 3 ? + 8 = 11	12 − 5 = 7 ? + 5 = 12

Subtract 7

14	12	15	13	16	11
7	5	8	6	9	4

Subtract 4

13	8	12	9	10	7
9	4	8	5	6	3

© 1974, SRA PURPOSE: Review of subtraction facts.

Write the numbers 5, 8, and 13 on the chalkboard. Let someone write an addition sentence, using these three numbers. *Can you write another addition sentence? a subtraction sentence? another subtraction sentence?* Repeat for other sets of numbers. Then slip in a set like 4, 4, 8.

goal Review of subtraction facts

page 195 Do the first two problems at the top of the page together. The emphasis is on using what is known in addition to help with subtraction.

If this technique doesn't help, suggest counting from 3 to 11. One counter (fingers can be the counters) for each number said will help the pupil find **how many.**

Have the pupils complete the three rows before talking about the grids at the bottom of the page.

lesson Pages 196, 197

goal Readiness for subtraction with renaming

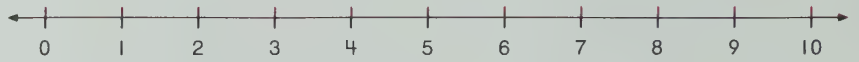
memo Knowing when whole-number subtraction **is not** possible is the first step to knowing when renaming is necessary for computation.

page 196 Note that the pupils are not asked to compute the facts. The focus is on the number line and learning when an answer cannot be found on that number line.

Work the two word problems together. The pupils are not expected to rename and subtract to find how many remain. You may be surprised by the methods they can think of, but most of them will count from a number to a number to find the answer.

196

Ring the subtraction facts that you cannot show on this number line.



1 − 0	1 − 1	1 − 2	2 − 1	2 − 2	2 − 3	3 − 3
6 − 4	8 − 9	2 − 5	5 − 8	6 − 1	3 − 4	6 − 3
3 − 6	7 − 2	0 − 1	6 − 8	9 − 6	5 − 7	0 − 0

How many remain?

27 people in the room.
9 people leave.
18 people remain.

33 posters made.
7 win prizes.
26 posters didn't win.

PURPOSE: Review of subtraction.

things 24-bottle wood case, adhesive tape, subtraction cards, egg timer or stopwatch

Use the tape to label 19 of the slots with the numerals 0 through 18. The focus is speed. The pupil places each flash card in the slot labeled with the answer. An egg timer or stopwatch can be used to keep time. Have the pupil make a record of his time, number correct, and number of errors. Have the youngster compete with himself to improve first his record of errors, and then the time needed.

name _____

Subtract 6

14	11	13	10	12	15
8	5	7	4	6	9

Subtract 5

13	11	10	12	14	9
8	6	5	7	9	4

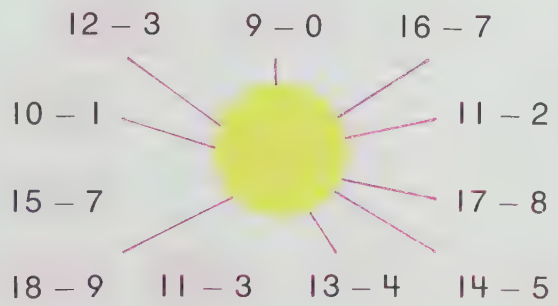
Subtract 8

14	10	15	16	17	13
6	2	7	8	9	5

Subtract 7

16	13	11	15	12	14
9	6	4	8	5	7

Find names for 9.
Connect the box to the circle.



Can you think of other names for 9?

15 – 6, 0 9
1 + 8, 2 7
3 + 6, 4 + 5
Accept also
5 + 4, 6 + 3
7 + 2, 8 + 1,
9 + 0

© 1974, SRA

PURPOSE: Review of subtraction.

Challenge the youngsters to find subtraction names for 25. Anyone who finds 5 names is a star. Ten names—you're a superstar! Fifteen names—WOW! You're a **big** superstar!

goal Practice with subtraction facts

warm-up Write a big numeral 5 on the chalkboard. *Who knows a subtraction name for 5?* Have it written under the 5. *Does someone know another subtraction name for 5?* Keep going until there are at least five different names. Encourage the youngsters to do their best thinking. Maybe they can find new names for 5.

page 197 The subtraction grid was introduced on page 195. You know how much additional explanation or review is necessary for your pupils. Note that the emphasis is on the facts needed for renaming.

Talk about how to do the rest of the page. Point out that the last question doesn't say that the names for 9 have to be subtraction names. *Who can find the most names?*

lesson Pages 198, 199

goal Review of subtraction, no renaming

things ten-trays
counters

page 198 Review the relation symbols together. The pupils may want to record the remainder under each sentence. This recording will help you determine whether an error is caused by an incorrect difference rather than a reversed relation symbol. The emphasis continues to be on facts needed for renaming.

Talk about the example in the middle of the page. Review the thought steps—they are very important? *How many ones remain? Where do you write that? How many tens remain? Where do you write that?* Have the whole remainder read.

Have the children do the last four problems by themselves. Anyone who makes an error corrects it by using ten-trays and counters.

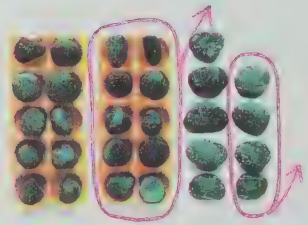
198

Remember, the head of the arrow points to the lesser numbers.
$>$ is read "is greater than." $<$ is read "is less than."
Use $>$ or $<$ to make each correct.

$9 - 9 \bigcirc 1 - 0$ ($<$) $\quad 13 - 8 \bigcirc 14 - 7$ ($<$) $\quad 3 - 0 \bigcirc 8 - 7$ ($>$)

$12 - 8 \bigcirc 10 - 7$ ($>$) $\quad 11 - 7 \bigcirc 9 - 4$ ($<$) $\quad 10 - 2 \bigcirc 14 - 8$ ($>$)

Remember what a good job you did on problems like these?



How many in all?
Ring 14. Take away.

tens	ones
2	9
− 1	4
1	5

Show how good you are on these.

tens	ones
4	7
− 1	2
3	5

tens	ones
5	3
− 1	1
4	2

tens	ones
6	9
− 3	2
3	7

tens	ones
8	7
− 6	3
2	4

PURPOSE: Review of subtraction.

name _____

It seems that Ben always got all of the problems right.
Here is one of Ben's papers. Did he get all of them right again? No

57 − 15 = 42	11 − 8 = 3	27 − 14 = 13	48 − 17 = 31	69 − 19 = 50	35 − 15 = 25 X
76 − 13 = 63	12 − 9 = 3	59 − 23 = 26 X	11 − 7 = 3 X	34 − 22 = 12	13 − 9 = 4

Find out if you can get all of them right.

39 − 7 = 32	17 − 9 = 8	28 − 6 = 22	48 − 8 = 40	86 − 15 = 71	18 − 5 = 13
25 − 14 = 11	11 − 9 = 2	14 − 5 = 9	59 − 8 = 51	52 − 30 = 22	15 − 8 = 7

© 1974, SRA

PURPOSE: Subtraction practice.

goal Practice in subtracting two 2-digit numbers, no renaming, and with hard subtraction facts

page 199 Can anyone find just one problem that Ben does not have correct? Perhaps there are more wrong answers. Talk about how the wrong answers will be identified. This decision should be the children's.

I know you can do better than Ben did. Anyone who has trouble here is just not ready to begin subtraction with renaming.

Go back to Ben's wrong problems. Write them on the board as they are identified. Who can show Ben how to get the correct answer?

lesson Pages 200, 201

goal Introduction to subtraction with renaming

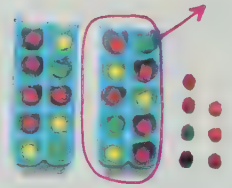
memo Pages 200 and 201 should be completed on the same day.

things for each group:
2 ten-trays
29 counters

warm-up Group 3 or 4 children together. Lead them through the following exploration. Focus on the action—no recording. *Show 27 with your trays and counters. How many full ten-trays? How many ones? Take away 10. How many ones remain? How many tens remain? Show 27 again. This time take away 15. How many ones will you take away? How many ones remain? How many tens will you take away? How many remain? Show 27 one more time. How many ones? Take away 8 ones.* Act puzzled. *Why can't you take away 8 ones? Does anyone have an idea?* If anyone wants to take the 8 ones from a full tray stop him with, *But that's a ten, not ones.* Persist until someone thinks of dumping a ten-tray so that there are 17 ones. *How many ones remain? How many tens remain?* Try another example.

page 200 The emphasis now is on how to record the action of the warm-up. Go nice and easy—step by step. You may want to demonstrate the action again as each step is discussed. Introduce RENAME when you talk about what happened to the tens at the bottom of the page. Go right on to page 201.

200

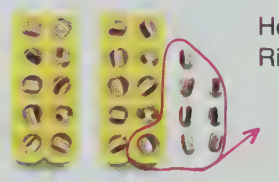


How many in all?
Ring 10. Take away.

tens	ones
2	7
− 1	0
1	7 ← How many ones remain?
↓	← How many tens remain?

How many in all?
Ring 15. Take away.

tens	ones
2	7
− 1	5
1	2 ← How many ones remain?
↓	← How many tens remain?



How many in all?
Ring 8. Take away.

tens	ones
2	7
−	8
1	9 ← How many ones remain?
↓	← How many tens remain?

Let's look at that one carefully.

tens	ones
2	7
−	8
	?

2 tens 7
− 8
NO

1 ten 17
− 8
YES

What happened to the tens?
They were renamed.

PURPOSE: Readiness for subtraction with renaming.

name _____

Subtract

tens	ones	
3	13	rename
4	3	to start with
–	5	to take away
3	8	ones remain
		tens remain

tens	ones	
1	15	rename
2	5	to start with
–	9	to take away
1	6	ones remain
		tens remain

tens	ones	
4	11	rename
5	1	to start with
–	7	to take away
4	4	ones remain
		tens remain

© 1974, SRA

PURPOSE: Readiness for subtraction with renaming.

goal Introduction to subtraction with renaming

memo There is a good reason for completing the renaming before starting to compute. See Notes and Things for a complete explanation.

things ten-trays
counters

page 201 Talk about **renaming** 3 tens 6 ones as 2 tens 16 ones. *What does it mean to rename?* (Give a different name)

Work together to complete each problem on the page. The printed sequenced-thought steps are **VERY IMPORTANT.**

Repeat them again and again. If there is any confusion, include the action with trays and counters.

lesson Page 202

goal Practice in renaming numbers

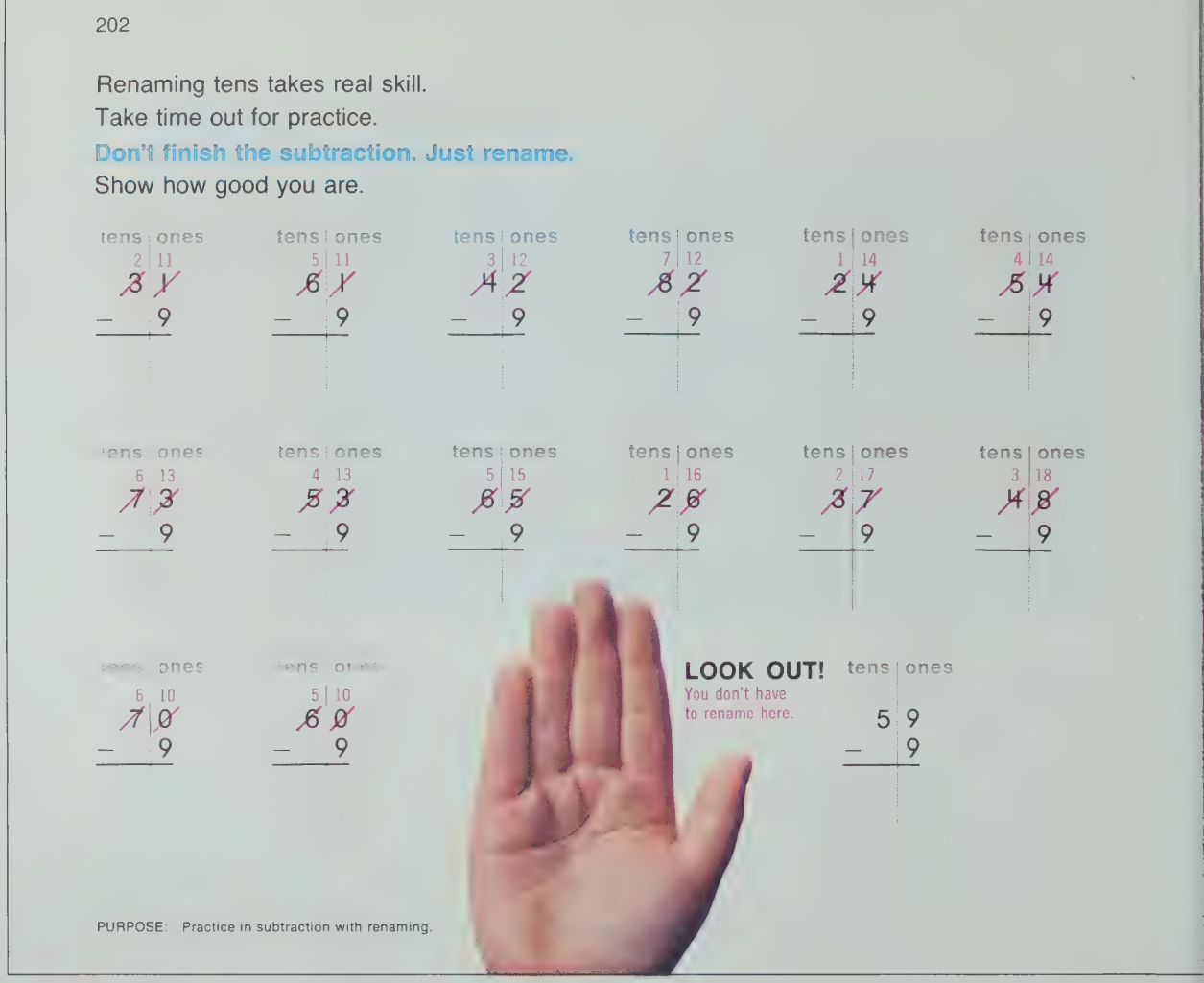
things for each group:
3 ten-trays
39 counters

warm-up Group the youngsters so they can share ten-trays and counters. Write on the board:

tens	ones
3	5
−	6

Show me 3 tens and 5 ones. What number do you have? (35) *Do you have 6 ones to take away? What can you do?* (Dump a tray) *What do we call that?* (Renaming) *How can we record renaming in this problem?* Have someone show the renaming on the board. *Can we take away 6 ones now? We don't have to find the answer to every problem; we just want to show the renaming that needs to be done* **before** *we can subtract to find the answer.*

page 202 As the children work, circulate and check to make sure each person understands the renaming process. Use ten-trays and counters with any who do not. No sense in practicing the wrong thing. Before leaving the page ask, *Did you ever rename more than 1 ten?*



things 2 wood or sugar cubes, counters

Label the faces of the 2 cubes as follows:
- 11, 12, 13, 14, 15, 16
- 4, 5, 6, 7, 8, 9

In turn the player rolls the cubes and subtracts the two numbers that land faceup. Take one counter for a correct answer; return one counter for a wrong answer. The player with the most counters wins.

name _____

How many in all?
Take away 8.

tens	ones
3	5
−	8
	NO

But you can do this.

Take 8 away.
How many remain?

tens	ones
~~3~~ 2	~~5~~ 15
−	8
2	7 ← How many ones remain?
	↑ How many tens remain?

YOUR TURN.

You'll have to rename a ten in every problem.

tens	ones
~~4~~ 3	~~2~~ 12
−	6
3	6 ← ones remaining
	↑ tens remaining

tens	ones
~~3~~ 2	~~4~~ 14
−	7
2	7

tens	ones
~~2~~ 1	~~1~~ 11
−	8
1	3

tens	ones
~~7~~ 6	~~2~~ 12
−	8
6	4

tens	ones
~~3~~ 2	~~5~~ 15
−	7
2	8

tens	ones
~~5~~ 4	~~3~~ 13
−	9
4	4

tens	ones
~~2~~ 1	~~6~~ 16
−	8
1	8

tens	ones
~~5~~ 4	~~7~~ 17
−	9
4	8

© 1974, SRA

PURPOSE: Introduction to the algorithm for subtraction with renaming.

lesson Pages 203, 204

goal Practice in subtracting a 1-digit number from a 2-digit number with renaming

page 203 Work the example with the children. Stress the sequenced-thought steps.

Since the pupils are told that they must rename for all the problems, you may want to concentrate on this step. Complete the renaming for all the problems and check this step before the youngsters finish the subtraction. You decide whether some of your pupils are ready to work independently on this important skill.

Any pupil who is having difficulty should work with ten-trays and counters. Watch for subtraction-fact errors and for the pupil who takes the easy way out and reverses the ones in computation. For example:

tens	ones
4	2
−	6
4	4

This pupil has computed the following problem:

tens	ones
4	6
−	2
4	4

goal Practice in subtracting a 1-digit number from a 2-digit number with renaming

page 204 Review renaming as you complete the first two problems together. Let your pupils try the next three problems on their own. Check together by having these problems worked on the board.

Pupils who made no errors may complete one of the two remaining rows on their own. Check again. Make sure they are on the right track before letting them go any further.

Continue to guide the other pupils with questions. *Why must you rename? How many tens after you rename? How many ones after you rename? Subtract. How many ones remain? How many tens remain?*

The question ***How many tens did you rename in each problem?*** appears on the page. *Do you think the answer will always be the same?*

You'll have to rename a ten to get enough ones in all of these problems.
Use your ten-trays if you need help.

tens	ones
1	14
~~2~~	~~4~~
−	5
1	9

tens	ones
4	16
~~5~~	~~6~~
−	8
4	8

tens	ones
2	16
~~3~~	~~6~~
−	7
2	9

tens	ones
7	11
~~8~~	~~1~~
−	7
7	4

tens	ones
3	11
~~4~~	~~1~~
−	9
3	2

tens	ones
2	13
~~3~~	~~3~~
−	6
2	7

tens	ones
3	15
~~4~~	~~5~~
−	9
3	6

tens	ones
1	12
~~2~~	~~2~~
−	5
1	7

tens	ones
2	14
~~3~~	~~4~~
−	6
2	8

tens	ones
2	11
~~3~~	~~1~~
−	4
2	7

tens	ones
4	11
~~5~~	~~1~~
−	3
4	8

tens	ones
1	18
~~2~~	~~8~~
−	9
1	9

tens	ones
3	15
~~4~~	~~5~~
−	8
3	7

tens	ones
6	14
~~7~~	~~4~~
−	7
6	7

tens	ones
2	10
~~3~~	~~0~~
−	9
2	1

Look back. How many tens did you rename in each problem? 1 ten in each problem.

PURPOSE: Practice in subtraction of a 1-digit number from a 2-digit number with renaming.

name _____

Girls do the first row. Boys do the second row.

4 17 5 7 − 8 4 9	1 11 2 1 − 7 1 4	5 16 6 6 − 9 5 7	8 10 9 0 − 4 8 6	4 12 5 2 − 5 4 7	6 10 7 0 − 6 6 4
2 15 3 5 − 7 2 8	1 16 2 6 − 8 1 8	5 11 6 1 − 5 5 6	8 13 9 3 − 6 8 7	3 13 4 3 − 7 3 6	5 12 6 2 − 3 5 9

Everybody do these.

1 10 2 0 − 3 1 7	3 18 4 8 − 9 3 9	6 13 7 3 − 4 6 9	7 11 8 1 − 9 7 2

35 guppies.
You can keep 6.

How many go? 29

97 box tops.
Only 8 are good for anything.

How many go? 89

41 rocks.
There is room for 7.

How many go? 34

© 1974, SRA PURPOSE: Subtraction practice.

lesson Pages 205, 206

goal Practice in subtracting a 1-digit number from a 2-digit number with renaming

memo If subtraction facts are causing a problem for some pupils, make sure that they spend some time practicing each day. Use peer tutors for work with flash cards and the many games suggested in the guide. And involve the parents again. Identify the specific facts and provide some activities or games to use.

page 205 Notice that the tens-ones heading is not above each problem. This is the start of a gradual phasing out of these words; however, the fine rule between tens and ones will continue throughout this level. Hope that most of the pupils will be working independently. Continue to work on the cause of difficulties with the youngsters who are struggling. Maybe they just aren't ready to do these problems. Avoid frustrating situations. This is the point where youngsters develop the feeling that they can't do math. The next step is hating it.

Encourage everyone.

My but you're smart.
You have learned a lot!

goal Practice in subtracting a 1-digit number from a 2-digit number with renaming

page 206 After the problems are completed and checked, take a survey. Which group had the most nearly perfect papers—the group with an **a** in their last name or the others? Why? Did that group have the hardest problems?

Use ten-trays and counters to help any child correct errors. Try to determine the cause of errors. Please provide practice related to the cause.

If you have the letter

in your last name, do the first two rows.

If you haven't, do the last two rows.

tens	ones
2	14
~~3~~	~~4~~
−	6
2	8

tens	ones
6	12
~~7~~	~~2~~
−	9
6	3

tens	ones
5	11
~~6~~	~~1~~
−	6
5	5

tens	ones
1	17
~~2~~	~~7~~
−	8
1	9

tens	ones
2	18
~~3~~	~~8~~
−	9
2	9

tens	ones
3	10
~~4~~	~~0~~
−	7
3	3

tens	ones
8	18
~~9~~	~~8~~
−	9
8	9

tens	ones
3	13
~~4~~	~~3~~
−	8
3	5

tens	ones
8	12
~~9~~	~~2~~
−	8
8	4

tens	ones
6	15
~~7~~	~~5~~
−	9
6	6

tens	ones
5	13
~~6~~	~~3~~
−	7
5	6

tens	ones
6	11
~~7~~	~~1~~
−	5
6	6

tens	ones
3	15
~~4~~	~~5~~
−	6
3	9

tens	ones
7	14
~~8~~	~~4~~
−	9
7	5

tens	ones
4	11
~~5~~	~~1~~
−	6
4	5

tens	ones
4	16
~~5~~	~~6~~
−	9
4	7

tens	ones
6	12
~~7~~	~~2~~
−	4
6	8

tens	ones
1	14
~~2~~	~~4~~
−	8
1	6

tens	ones
8	13
~~9~~	~~3~~
−	4
8	9

tens	ones
4	10
~~5~~	~~0~~
−	5
4	5

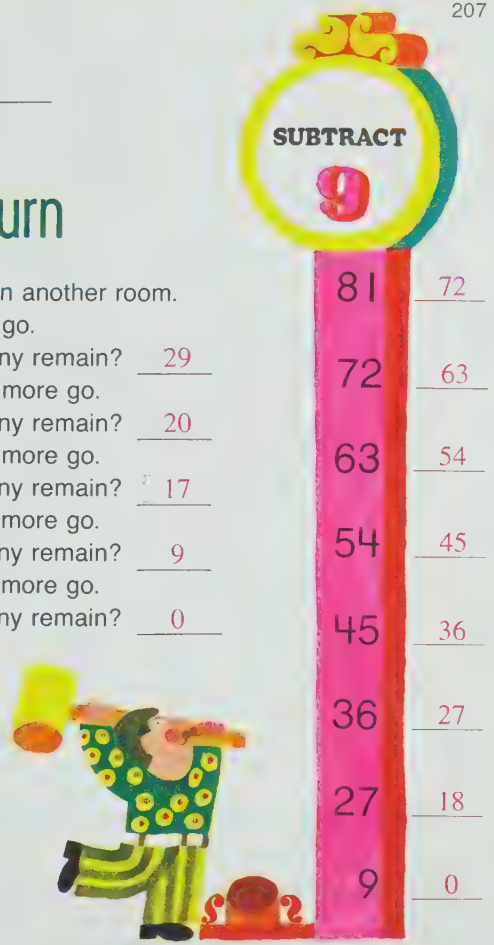
PURPOSE: Practice in subtraction with renaming.

name _____

everybody gets a turn

36 kids in one room.
9 go.
How many remain? 27
8 more go.
How many remain? 19
6 more go.
How many remain? 13
7 more go.
How many remain? 6
6 more go.
How many remain? 0

33 kids in another room.
4 go.
How many remain? 29
9 more go.
How many remain? 20
3 more go.
How many remain? 17
8 more go.
How many remain? 9
9 more go.
How many remain? 0



© 1974, SRA PURPOSE: Subtracting in story situations.

lesson Page 207

goal Application of subtraction with renaming in word problems

things paper for computation

page 207 It's time to try something different. Arm everyone with a long narrow piece of paper. Read the first word problem. It's a whole column long. *What question is asked over and over again? What will you have to do to find the answer? Better start way at the top of your paper. What's the first problem? Who has the answer?* If there are any disagreements, settle them at the board. *How many more go? Write that right under the first answer.* Their papers will look like this:

2 16
~~3~~ ~~6~~
− 9

2 7
− 8

Continue in this way through all the steps. If the youngsters find writing one long problem confusing, by all means encourage them to write each one separately.

In the second column, once they reach 17 minus 8 encourage everyone to compute mentally. The two word problems should have everyone ready to try to ring the 9 bell.

lesson Page 208

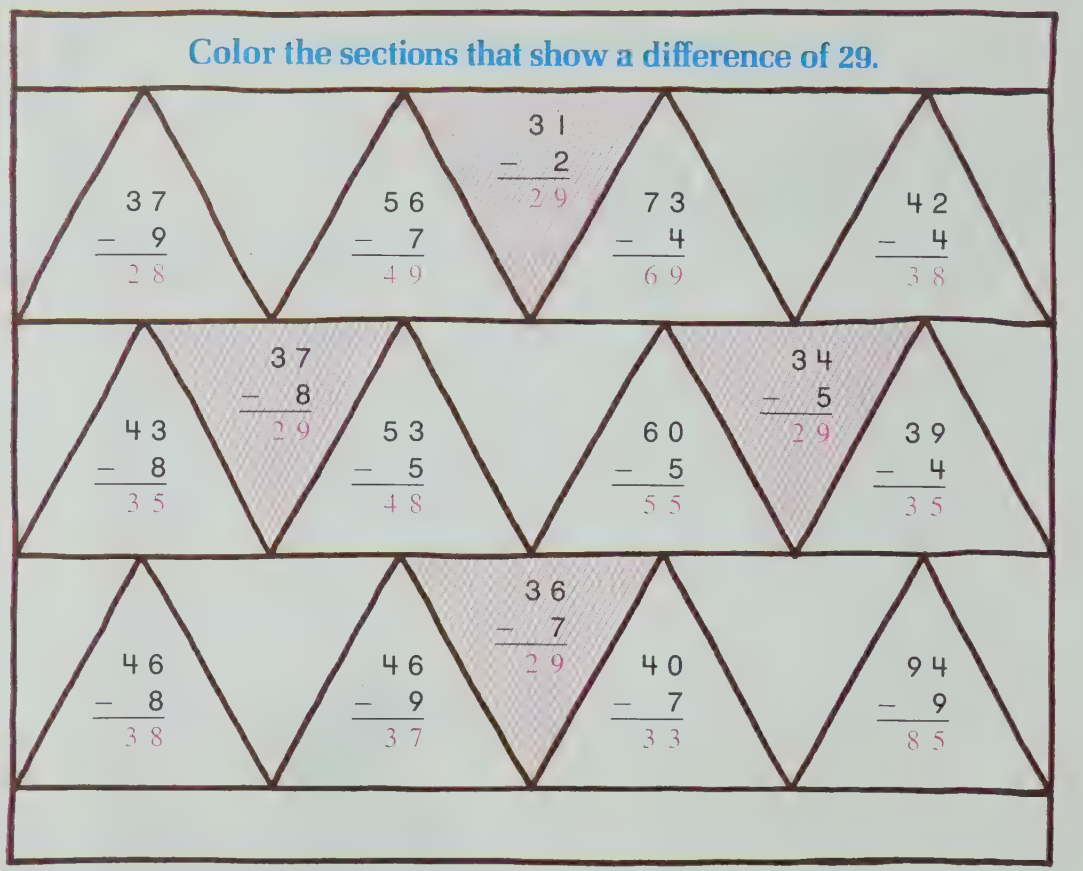
goal **Progress Check**—subtracting a 1-digit number from a 2-digit number with renaming

things crayons

page 208 Read the directions together. This page will tell you who needs more practice. It will also tell you who can read and follow directions.

Look at the errors. Did anyone rename for 39 minus 4 even though it wasn't necessary? Back to ten-trays and counters. Look for renaming errors and subtraction-fact errors.

208

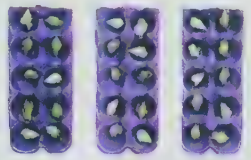


PURPOSE: Progress check—subtraction.

See activity 1, page 216a.

See activity 2, page 216a.

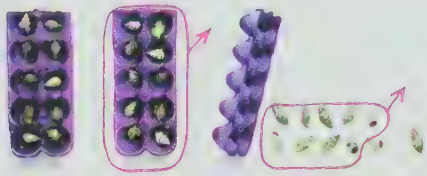
name _____



$$\begin{array}{r|l} 3 & 1 \\ -\ 1 & 9 \\ \hline & ? \end{array}$$

to start with
to be taken away
← How many ones remain?
How many tens remain?

This time take 19 away from 31.



Dump a ten-tray. Then take 19 away.

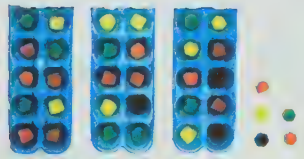
How many tens remain? 1

How many ones remain? 2

Here's how you write the action.

$$\begin{array}{r|l} 2 & 11 \\ \not{3} & \not{1} \\ -\ 1 & 9 \\ \hline 1 & 2 \end{array}$$

to start with
to be taken away
← How many ones remain?
How many tens remain?



$$\begin{array}{r|l} 2 & 15 \\ \not{3} & \not{5} \\ -\ 1 & 6 \\ \hline 1 & 9 \end{array}$$

to start with
to be taken away
← How many ones remain?
How many tens remain?

© 1974, SRA

PURPOSE: Introduction to subtraction of 2-digit numbers with renaming.

lesson Pages 209, 210, 211

goal Introduction to subtraction of two 2-digit numbers with renaming

memo Pages 209 and 210 should be completed on the same day.

things 3 ten-trays
35 counters

page 209 If the sequenced-thought steps have been repeated often enough, chances are that no one will really see anything very different about these problems. Those same steps are used again.

Work right along with the children step by step. Show the action described with ten-trays. Emphasize taking care of the ones first. Go right on to page 210.

goal Practice in renaming and in subtraction with renaming

page 210 Time out to review only the renaming step again. The directions at the top of the page are very important. The youngsters should be delighted that they don't have to complete the subtraction. Talk about the completed example. When the two charts are completed, ask, *What happens to the number of tens each time?* (Decreases 1 ten) *What happens to the number of ones?* (Increases by 10 ones)

Work the four problems together. *What must you do first?* (Rename) *Do it. How many tens now? How many ones? Where do you begin to subtract?* (Ones) *How many ones remain? How many tens remain?*

Pretend you are going to subtract a number that has 9 in the ones place.

You have to rename the top number.
Practice renaming. Don't subtract.

PRETEND PROBLEM	BEFORE RENAMING	AFTER RENAMING
83 − 19	83	7 tens + 13
62 − 39	62	5 tens + 12
38 − 29	38	2 tens + 18
57 − 49	57	4 tens + 17

PRETEND PROBLEM	BEFORE RENAMING	AFTER RENAMING
81 − 59	81	7 tens + 11
74 − 29	74	6 tens + 14
45 − 39	45	3 tens + 15
70 − 49	70	6 tens + 10

Try this idea on the real thing.
Subtract.

tens	ones	
4	13	
~~5~~	~~3~~	rename
− 3	9	
1	4	

tens	ones	
2	15	
~~3~~	~~5~~	rename
− 1	9	
1	6	

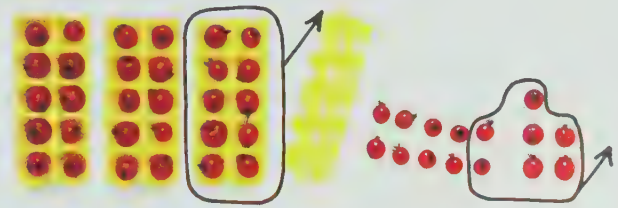
tens	ones	
3	11	
~~4~~	~~1~~	rename
− 2	9	
1	2	

tens	ones	
5	10	
~~6~~	~~0~~	rename
− 4	9	
1	1	

PURPOSE: Practice in subtraction with renaming.

name _____

$$\begin{array}{r} 45 \\ -\ 17 \\ \hline ??\end{array}$$



$$\begin{array}{r} 3\,15 \\ \not{4}\not{5} \\ -\ 17 \\ \hline 28\end{array}$$ remain

Complete any 12 problems.

4 14 $\not{5}\not{4}$ − 25 29	5 11 $\not{6}\not{1}$ − 44 17	3 10 $\not{4}\not{0}$ − 11 29	7 15 $\not{8}\not{5}$ − 29 56	7 11 $\not{8}\not{1}$ − 53 28	5 14 $\not{6}\not{4}$ − 18 46	6 16 $\not{7}\not{6}$ − 38 38
7 13 $\not{8}\not{3}$ − 39 44	5 11 $\not{6}\not{1}$ − 27 34	7 13 $\not{8}\not{3}$ − 15 68	3 12 $\not{4}\not{2}$ − 14 28	7 16 $\not{8}\not{6}$ − 47 39	4 17 $\not{5}\not{7}$ − 48 9	6 18 $\not{7}\not{8}$ − 59 19
7 11 $\not{8}\not{1}$ − 42 39	5 11 $\not{6}\not{1}$ − 38 23	8 12 $\not{9}\not{2}$ − 26 66	7 10 $\not{8}\not{0}$ − 68 12	4 11 $\not{5}\not{1}$ − 43 8	6 14 $\not{7}\not{4}$ − 25 49	5 17 $\not{6}\not{7}$ − 38 29

© 1974, SRA

PURPOSE: Practice in subtraction with renaming

goal Practice in subtracting two 2-digit numbers with renaming

page 211 Talk about the example together. You may want to show the action with ten-trays and counters. Choosing which 12 problems to do will be a big decision. Let it be the pupil's choice.

Examine any errors for the cause.

- Has the pupil renamed correctly?
- Are subtraction facts the culprit?

Each child who makes errors should have a clear pattern of errors by now. In a way that's good. An individual conference will let the learner know specifically what the trouble is, and the responsibility for correcting the trouble becomes more the learner's task. Your role can be to give support and encouragement.

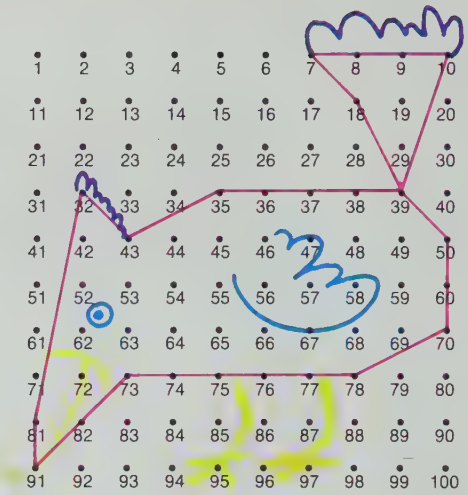
lesson Pages 212, 213

goal Practice in subtracting with 2-digit numbers

page 212 *Who remembers how to do this kind of page?* Before the pupils begin to work independently, examine the problems together. *Look at the first problem. Do you have to rename? What about the next problem? the last problem in the row? Can you find another problem where you don't have to rename? Be careful as you work.*

212

To connect the dots, complete each row of problems below. Start at the dot having the same number as your first answer. Draw a line to the dot for your second answer. Keep going until you reach your last answer.



5 | 11 ~~6~~ ~~1~~ − 2 9 3 2	8 | 10 ~~9~~ ~~0~~ − 9 8 1	9 5 − 4 9 1			
7 | 12 ~~8~~ ~~2~~ − 9 7 3	8 | 14 ~~9~~ ~~4~~ − 1 6 7 8	8 4 − 1 4 7 0	7 0 − 2 0 5 0	4 | 13 ~~5~~ ~~3~~ − 1 4 3 9	9 8 − 8 8 1 0
5 | 10 ~~6~~ ~~0~~ − 5 3 7	5 9 − 4 1 1 8	5 | 17 ~~6~~ ~~7~~ − 2 8 3 9	6 | 12 ~~7~~ ~~2~~ − 3 7 3 5	5 | 11 ~~8~~ ~~1~~ − 1 8 4 3	8 7 − 5 5 3 2

PURPOSE: Subtraction practice.

name _____

5 16 ~~6~~ ~~6~~ − 4 7 1 9	3 12 ~~4~~ ~~2~~ − 2 3 1 9	1 18 ~~2~~ ~~8~~ − 1 9 9	7 9 − 4 5 3 4	6 15 ~~7~~ ~~5~~ − 3 9 3 6
5 12 ~~6~~ ~~2~~ − 2 5 3 7	4 14 ~~5~~ ~~4~~ − 1 7 3 7	5 3 − 4 3 1 0	6 14 ~~7~~ ~~4~~ − 1 9 5 5	4 15 ~~5~~ ~~5~~ − 3 8 1 7
7 13 ~~8~~ ~~3~~ − 3 5 4 8	5 1 − 3 0 2 1	6 16 ~~7~~ ~~6~~ − 1 9 5 7	2 16 ~~3~~ ~~6~~ − 1 8 1 8	4 17 ~~5~~ ~~7~~ − 2 9 2 8
6 14 ~~7~~ ~~4~~ − 2 5 4 9	8 12 ~~9~~ ~~2~~ − 3 8 5 4	7 9 − 3 6 4 3	4 14 ~~5~~ ~~4~~ − 4 6 8	8 11 ~~9~~ ~~1~~ − 5 6 3 5

© 1974, SRA

PURPOSE: Subtraction practice.

goal Practice in subtracting with 2-digit numbers

page 213 *Who do you think the man is?* (Teacher) *What is he saying to you? Can you find a problem that doesn't need renaming?*

Two rows are enough practice, for goodness sake. Let the pupil make this choice.

goal Using subtraction in word problems

page 214 Does anyone need help with the words? *How will you find the answer?* Notice that there are some new word clues to signal subtraction. The familiar **How many remain?** is not the question for the day. Look out! Some pupils may not realize that subtraction is needed to solve each problem.

The last problem provides everyone an opportunity to be creative. The youngsters will want to share the results of their efforts.

214

A Fun Fair

The Ferris wheel.
63 tickets sold.
27 adult tickets.
How many children's tickets? 36

The food stand.
91 hotdogs and hamburgers.
53 hotdogs.
How many hamburgers? 38

The ring toss.
92 tickets sold.
63 children's tickets.
How many adult tickets? 29

The fishpond.
87 prizes.
49 cost less than a dime.
How many cost a dime or more? 38

4 | 12	3 | 11	5 | 16	8 | 15	7 | 16
~~5~~ ~~2~~	~~4~~ ~~1~~	~~6~~ ~~6~~	~~9~~ ~~5~~	~~8~~ ~~6~~
− 3 5	− 2 9	− 3 9	− 4 8	− 5 7
1 7	1 2	2 7	4 7	2 9

Use the numbers in one of the problems you just did. Make up a story.

(Encourage creativity.)

PURPOSE: Subtracting in story situations.

name _____

Some people like to find the quickest way of getting things done. If you're one of those people, look at the different ways a problem can be written.

How are they different?

Different way of writing the renaming.

$$\begin{array}{r} {\scriptstyle 2}\,{\scriptstyle 14} \\ \not{3}\,\not{4} \\ -\ 8 \\ \hline 26 \end{array}$$

or

How are they alike?

Both require renaming. Both answers the same. Both are the same problem.

$$\begin{array}{r} {\scriptstyle 2}\,{\scriptstyle 1} \\ \not{3}\,4 \\ -\ 8 \\ \hline 26 \end{array}$$

Try the quickest way at least on the first row.

$$\begin{array}{r} {\scriptstyle 3}\,{\scriptstyle 1} \\ \not{4}\,3 \\ -\ 1\,8 \\ \hline 2\,5 \end{array} \qquad \begin{array}{r} {\scriptstyle 2}\,{\scriptstyle 1} \\ \not{3}\,1 \\ -\ 1\,2 \\ \hline 1\,9 \end{array} \qquad \begin{array}{r} {\scriptstyle 6}\,{\scriptstyle 1} \\ \not{7}\,0 \\ -\ 2\,8 \\ \hline 4\,2 \end{array} \qquad \begin{array}{r} {\scriptstyle 1}\,{\scriptstyle 1} \\ \not{2}\,5 \\ -\ 1\,6 \\ \hline 9 \end{array} \qquad \begin{array}{r} {\scriptstyle 3}\,{\scriptstyle 1} \\ \not{4}\,4 \\ -\ 2\,9 \\ \hline 1\,5 \end{array} \qquad \begin{array}{r} {\scriptstyle 4}\,{\scriptstyle 1} \\ \not{5}\,4 \\ -\ 3\,7 \\ \hline 1\,7 \end{array} \qquad \begin{array}{r} {\scriptstyle 7}\,{\scriptstyle 1} \\ \not{8}\,7 \\ -\ 4\,9 \\ \hline 3\,8 \end{array}$$

$$\begin{array}{r} {\scriptstyle 6}\,{\scriptstyle 1} \\ \not{7}\,3 \\ -\ 3\,4 \\ \hline 3\,9 \end{array} \qquad \begin{array}{r} {\scriptstyle 8}\,{\scriptstyle 1} \\ \not{9}\,0 \\ -\ 1\,1 \\ \hline 7\,9 \end{array} \qquad \begin{array}{r} {\scriptstyle 5}\,{\scriptstyle 1} \\ \not{6}\,8 \\ -\ 1\,9 \\ \hline 4\,9 \end{array} \qquad \begin{array}{r} {\scriptstyle 6}\,{\scriptstyle 1} \\ \not{7}\,6 \\ -\ 1\,7 \\ \hline 5\,9 \end{array} \qquad \begin{array}{r} {\scriptstyle 4}\,{\scriptstyle 1} \\ \not{5}\,4 \\ -\ 2\,8 \\ \hline 2\,6 \end{array} \qquad \begin{array}{r} {\scriptstyle 8}\,{\scriptstyle 1} \\ \not{9}\,2 \\ -\ 5\,7 \\ \hline 3\,5 \end{array} \qquad \begin{array}{r} {\scriptstyle 5}\,{\scriptstyle 1} \\ \not{6}\,1 \\ -\ 3\,9 \\ \hline 2\,2 \end{array}$$

© 1974, SRA PURPOSE: Subtraction practice.

lesson Page 215

goal Introduction of a shorter form for renaming

page 215 Some of your pupils may have already learned the shorter form for renaming from their families. Others may not be ready for this notation shortcut. Talk about the examples. Work 2 or 3 problems together, using the *quick* way. Ask the youngsters to finish the first row with the quick way. Check results. Let each one decide which way to show the renaming in the bottom row.

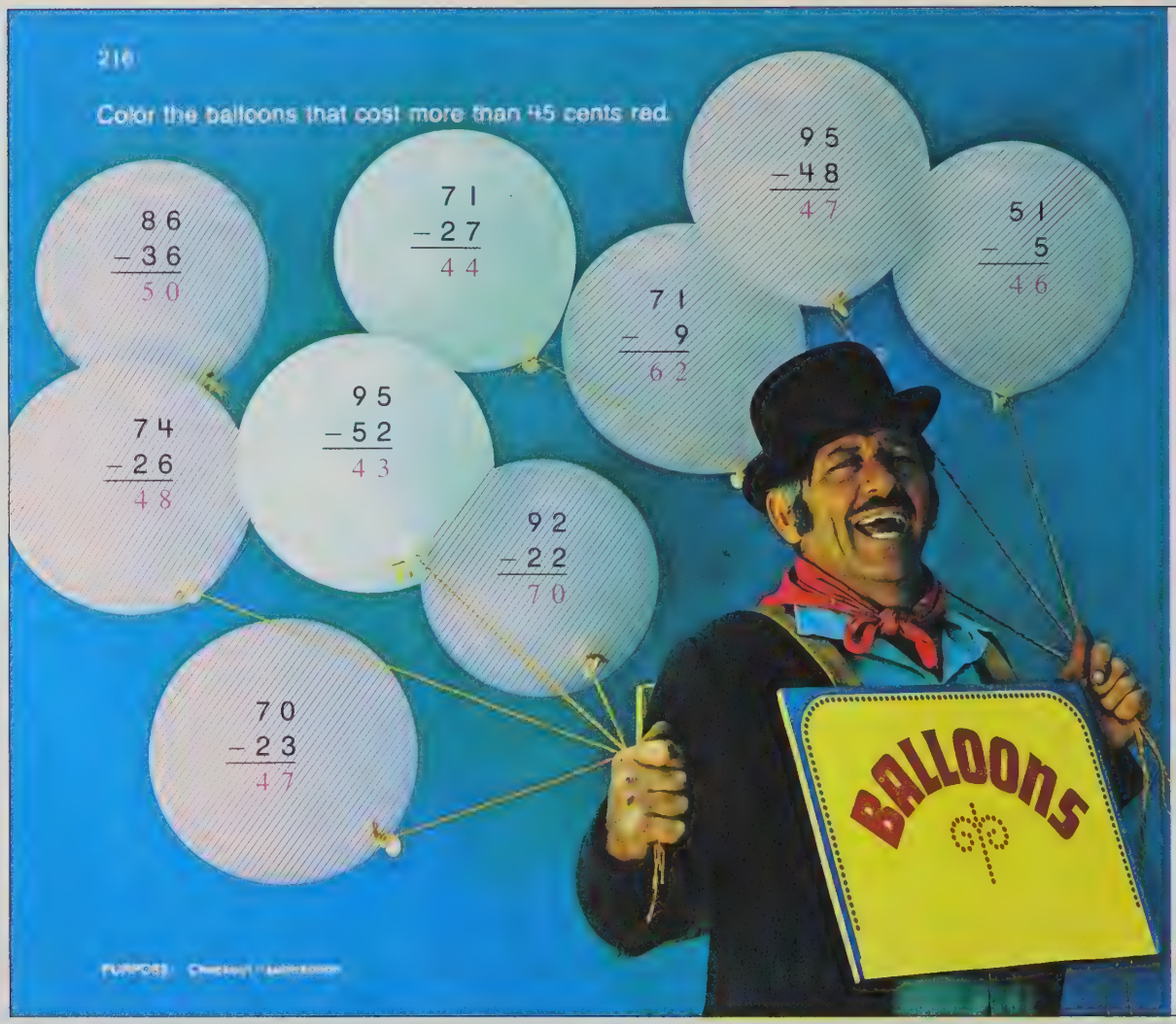
goal **Checkout**—subtraction of 2-digit numbers with renaming

page 216 *Can you find one problem that doesn't need renaming? That means you'll have to work carefully.* This is independent work for everyone.

Examine any errors for the cause.

- Did the pupil rename when renaming wasn't necessary?
- Did the pupil make an error in renaming?
- Did the pupil goof with a subtraction fact?

You have probably tried everything by now to help those who need help. Maybe the less capable will be able to tackle subtraction next time. Those who succeeded really deserve **congratulations.**



See activity 3, page 216a.

See activity 4, page 216a.

RESOURCES

another form of evaluation

for progress check – page 208

Subtract.

36 − 8 = 28	57 − 9 = 48	31 − 4 = 27	60 − 7 = 53
42 − 9 = 33	24 − 6 = 18	85 − 8 = 77	98 − 9 = 89
50 − 6 = 44	69 − 5 = 64	73 − 7 = 66	32 − 9 = 23

for checkout – page 216

Subtract.

41 − 5 = 36	52 − 32 = 20	60 − 29 = 31	72 − 9 = 63	39 − 14 = 25
86 − 37 = 49	53 − 35 = 18	80 − 12 = 68	24 − 8 = 16	97 − 74 = 23

activities

1. Write as many problems on the chalkboard as you have children playing the game. Form two teams. Give the first person on each team a piece of chalk and an eraser. When a signal is given, the first person on each team goes to the board and works any problem written there, and then takes the chalk and eraser to the next person on his team. The goal is to get all the players on your team to the board and back to their places first.

Warn the players to watch the other team's work carefully. If an error is seen, they are to call attention to it. The player must correct his error before he can pass the chalk and eraser on to his teammate.

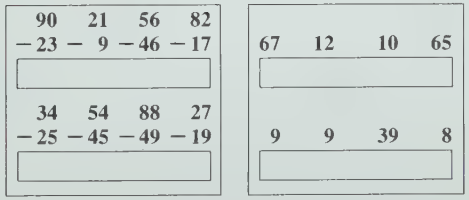
2. things game board, scratch paper, box

Prepare a football-field game board and a football appropriate for the size of the field. Write a problem on each piece of paper, fold the paper so that the problem cannot be seen, and place the papers in the box.

Form two teams. Place the ball on the 50-yard line. Players decide which team will kick off. The first player selects a problem and writes the answer. If the answer is correct, the ball is moved 10 yards in the appropriate direction and the next player on the same team draws a problem. This continues until the team makes a touchdown or a mistake. If the opposing team can correct the mistake, the ball moves 10 yards in the opposite direction and that team begins to select problems. When a touchdown is made, the ball returns to the 50-yard line and goes to the opposing team. Small teams will keep the interest level high.

3. things tagboard cards

Prepare problem cards as shown—no two cards exactly alike.



Cut a long slot where the answers should be written. On the reverse side of the card write each answer above the slot in the corresponding position.

The pupil lays the problem card over a sheet of paper, records his answers through the slot, turns the card over, and checks his answers. Pupils exchange cards for more practice.

4. things 16 index cards, counters

Write one of the following problems on each card—answers on back of the card to settle disputes.

77 −39	43 −25	28 −19	92 −58
50 −38	31 −17	72 −46	85 −38
72 −29	57 −28	91 −63	80 −27
62 −37	83 −68	64 −48	64 −15

Have each player make a game board by folding a piece of paper into 16 sections. Call out the following numbers: 9, 12, 14, 15, 16, 18, 25, 26, 28, 29, 34, 38, 43, 47, 49, 53. The players write these numbers on their game boards in any order, one on each section.

The cards are mixed and one card is shown at a time. The players compute the answer (on scratch paper if necessary), find this number on their game board, and cover it with a counter. The first player to cover 4 numbers in a row, column, or diagonal, calls out "Subtracto" and wins. The boards are cleared of counters, the problem cards are mixed again, and play continues.

additional learning aids

operation—chapter objectives 1, 2, 3, 4, and 5

SRA products

Computapes, SRA (1972)
Module 2, Lessons: AS 32, 33, 34
Inquisitive Games: Exploring Numbers and Space, SRA (1967)
Buy and Sell Game II
Mathematics Involvement Program, SRA (1971)
Card: 104
Skill through Patterns, level 2, SRA (1974)
Spirit masters: 17, 32, 38, 39
Visual Approach to Mathematics, level 2, SRA (1967)
Visuals: 9, 10

Make a copy of these.

© 1974, SRA. Permission to reproduce for school use.

11 FRACTIONS

before this chapter the learner has —

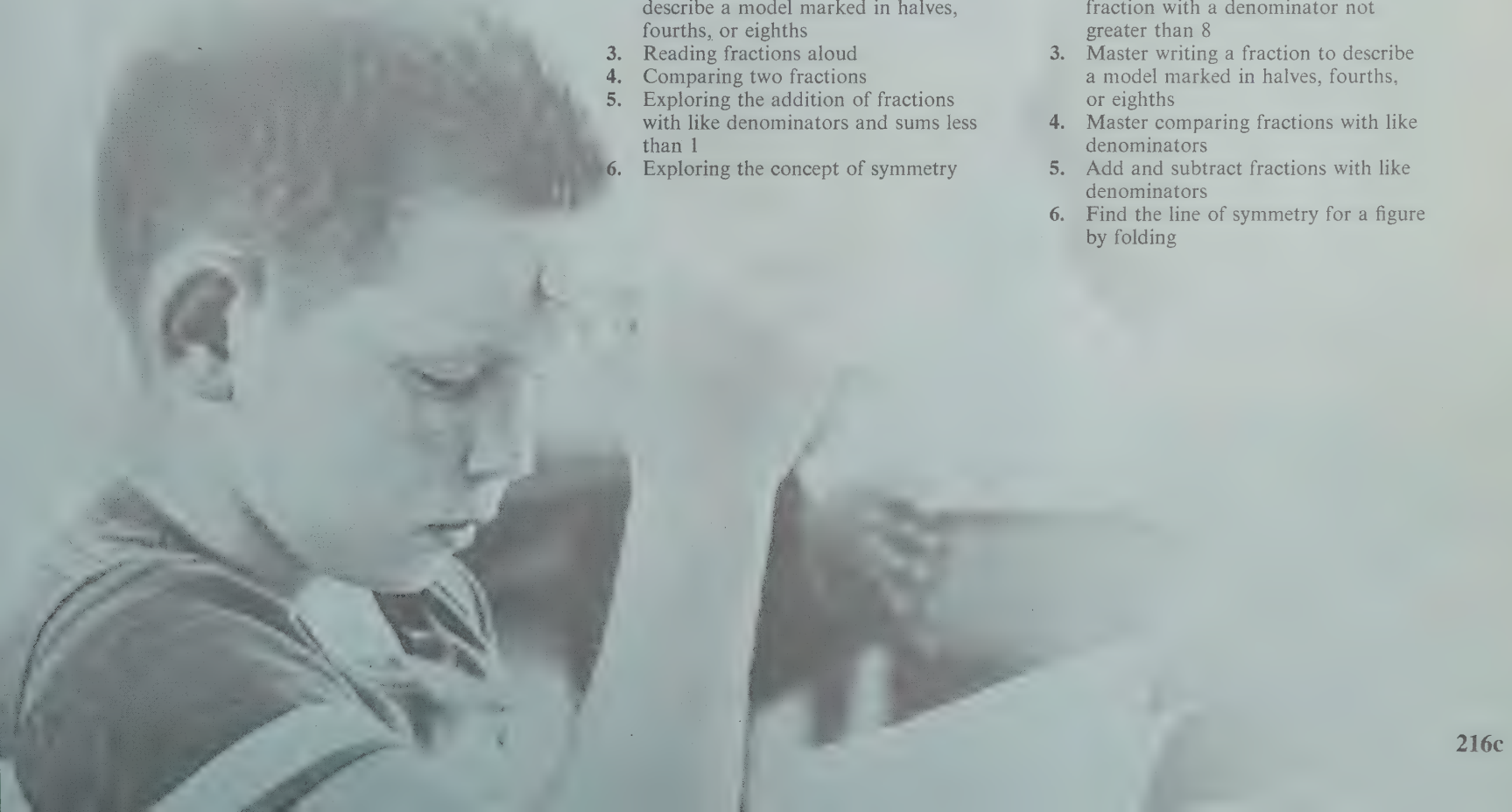
1. Written fractions to describe models marked in halves or fourths
2. Compared whole numbers

in chapter 11 the learner is —

1. Making fraction models to solve word problems
2. Mastering the writing of a fraction to describe a model marked in halves, fourths, or eighths
3. Reading fractions aloud
4. Comparing two fractions
5. Exploring the addition of fractions with like denominators and sums less than 1
6. Exploring the concept of symmetry

in later levels the learner will —

1. Master identifying the numerator and the denominator of any fraction
2. Make a model to represent any fraction with a denominator not greater than 8
3. Master writing a fraction to describe a model marked in halves, fourths, or eighths
4. Master comparing fractions with like denominators
5. Add and subtract fractions with like denominators
6. Find the line of symmetry for a figure by folding



Notes & Things

The idea of fractions is not new to children. Probably every one of them at some time has argued that he has gotten the smaller half. The ideas that the youngsters already have may need a little correcting, but that job will not be difficult. The secret is thinking about the numerator and the denominator and what each of these two numbers means.

The models presented in this chapter are limited to regions. Fractional parts of a set and the fractional part of a distance shown on a number line have been deliberately delayed until a later level and after each learner has a chance to understand the fractional-number notation. Let's face it, they are funny looking numbers!

You will see all sorts of regions in this chapter and the same questions asked over and over again.

How many shaded?
How many in all?

The answers to the questions will let a child come to know what the "top number" and the "bottom number" in a fraction are all about.

The children will explore addition of fractions with like denominators. They will see the number of parts in the whole thing, thus they can reason in this way:

$\frac{1}{4} + \frac{1}{4}$ "There are 4 parts. The problem says that 1 of the 4 parts is added to another 1 of the 4 parts. That means there will be 2 of the 4 parts in all."

The addition problems are put into simple word problems. The youngsters should feel very proud of themselves after working with this grownup idea.

The pages on fractions evolve into a special study ordinarily put in a chapter on geometry.

The folding activities necessary to begin work with symmetry enable the child to extend his understanding of fractions also. So why not have some fun and work with both ideas at the same time? The interest should be great enough to help the youngsters make many more discoveries than those presented on the pupil pages.

words

There are no new concept-development words for this chapter.

things

crayons of 2 colors
cutout objects
for each pupil:
- piece of string or ruler
- circular piece of paper
- straightedge, string (optional)

For the extra activities you will want to have these things available:
- envelopes
- index cards
- strips of adding-machine tape
- sets of colored rods or colored straws
- construction-paper squares, rectangles, and triangles

name _____

You can have one piece. Which one will you take?

Who has more cake?
(Both have the same amount.)

© 1974, SRA

PURPOSE: Introduction to fractions.

lesson Pages 217, 218

goal **Survey**—concept of fractions

page 217 Many questions can be asked about these two cakes to help you determine how much your pupils know about the concept of fractions.

Are the cakes the same size? How many pieces in the cake on the left? Are the pieces all the same size? How many pieces in the other cake? Is one piece larger than the other pieces? Which cake has the larger pieces? How can that be?

If Jean took 4 pieces from the cake on the left, **how much** *of the cake remains? If Jean took 3 pieces from the cake on the right,* **how many** *pieces remain?* **How much** *of the cake is that?* Do the children answer the **how much** question with **half** or **one-half?**

Could you eat half a cake? How many pieces is that? Examine both cakes to answer the last question. *How would you feel? Would it make a difference if you had a tiny cake? What about a giant-size cake? Who knows how to write one-half?* Have the answer written on the board.

goal Solving word problems by making fraction models

page 218 The children are to draw a picture to illustrate each word problem. Help with the words, but the pictures are to be theirs.

Talk about the results. How many pieces were made to show halves? Are the pieces about the same size? Nobody will be able to make the parts exactly the same size.

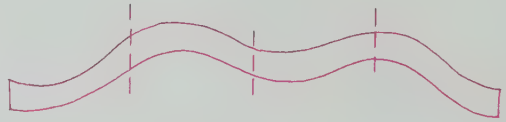
Does everyone remember how to read the fractions $\frac{1}{4}$ and $\frac{3}{4}$? Pupils were introduced to what each part of a fraction tells in level 1 of this program. Use the last problem to survey how much they remember. No need to worry. The next two pages will review these ideas.

218

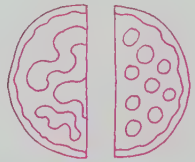
Draw a picture

He got a candy bar.
He gave $\frac{1}{2}$ to his sister. He kept $\frac{1}{2}$.
Show how he broke the candy bar.

She had a long ribbon.
She cut it into 4 same-size pieces.
Show the ribbon.
Show where she would cut.



They had $\frac{1}{2}$ of a cheese pizza.
They had $\frac{1}{2}$ of a sausage pizza.
Show how much they had in all.



Match the picture with
the fraction that tells
the number of shaded parts.

$\frac{1}{4}$ $\frac{3}{1}$

$\frac{3}{4}$ $\frac{1}{3}$

PURPOSE: Working with fractions in story situations.

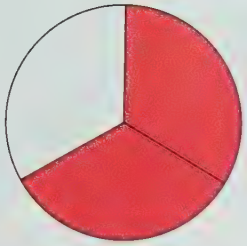
219

name _____

Fill in the blanks and boxes.

How many shaded? 2

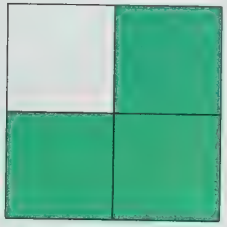
How many in all? 3



What part is shaded? 2/3

How many shaded? 3

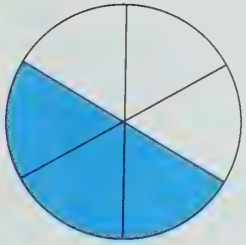
How many in all? 4



What part is shaded? 3/4

How many shaded? 3

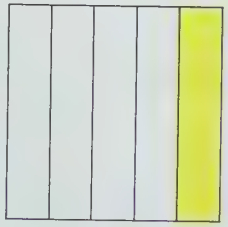
How many in all? 6



What part is shaded? 3/6

How many shaded? 1

How many in all? 5



What part is shaded? 1/5

© 1974, SRA

PURPOSE: Review of fractions.

lesson Pages 219, 220

goal Review of writing fractions to tell what part

page 219 No need for fancy names like numerator and denominator. The emphasis is on what the top number tells and what the bottom number tells. The entire fraction tells **how much** or **what part.**

Work the first problem together. Can your pupils handle the questions with ease? Is this a review or does all this seem new? The answers to these questions will determine how much guidance you will give for the remainder of the page.

goal Review of writing fractions to tell how much

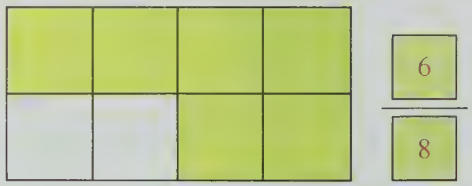
page 220 Review the example with everyone. *How much of this* REGION *is shaded?* Point out that the questions for each problem have disappeared. *What does the top number tell? What does the bottom number tell? What is the name for the fraction? What does the fraction tell?* Have the pupils work the first two problems independently. Check the results to make sure everyone is on the right track before completing the page.

When checking, ask the **how much** question and have the youngsters practice reading the completed fraction aloud.

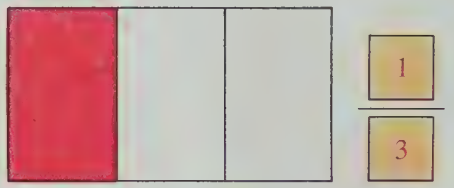
220

$\frac{4}{5}$ How many parts are shaded? / How many parts in all?

How much is shaded? Write a fraction.

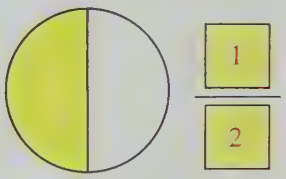


$\frac{6}{8}$

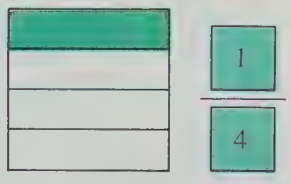


$\frac{1}{3}$

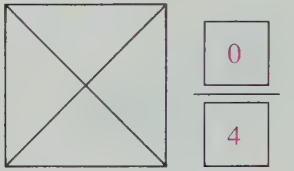
$\frac{1}{5}$



$\frac{1}{2}$



$\frac{1}{4}$



$\frac{0}{4}$

PURPOSE: Review of fractions.

things 4 envelopes, index cards

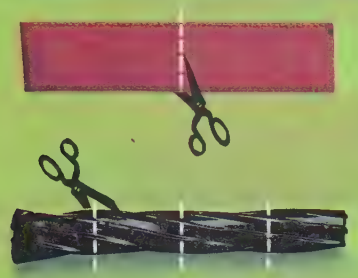
Label each envelope with one of these fractions: $\frac{1}{2}$, $\frac{1}{3}$, $\frac{1}{4}$, $\frac{1}{8}$.

Make several cards to show each fraction. For example:

Mix the completed cards. The pupil sorts the cards into the appropriate envelope.

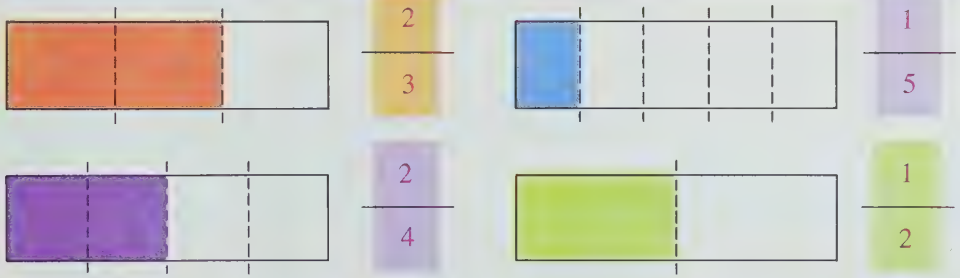
name _____

How much is cut off? Write a fraction.



$\frac{1}{2}$ $\frac{1}{3}$ $\frac{3}{4}$ $\frac{1}{4}$

How much is shaded? Write a fraction.



$\frac{2}{3}$ $\frac{1}{5}$ $\frac{2}{4}$ $\frac{1}{2}$

Let's talk Which is more? $\frac{2}{3}$ or $\frac{2}{4}$ $\frac{1}{5}$ or $\frac{1}{2}$ $\frac{2}{4}$ or $\frac{1}{2}$ $\frac{3}{3}$ or $\frac{4}{4}$

Both are the same. Both are the same.

© 1974, SRA

PURPOSE: Comparing fractions.

lesson Page 221

goal Practice in writing fractions to tell how much; comparing two fractions

page 221 Look at the first four problems. *Will the number above the line tell how many are shaded? What will it tell?* (How many of the parts are cut off) *What will the number below the line tell?* (How many parts in all)

Use this page to determine which pupils are able to write a fraction to answer the **how much** question.

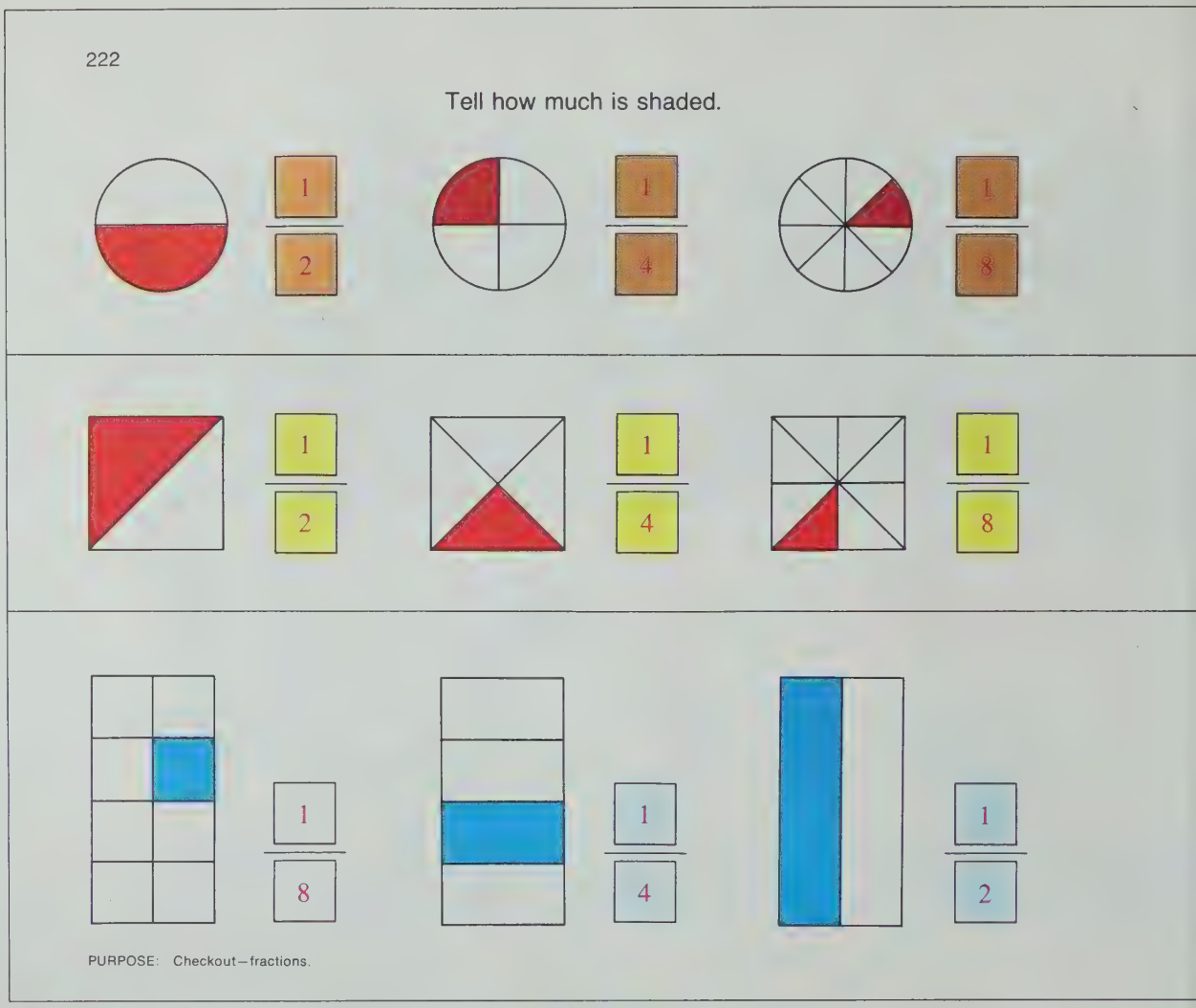
Take advantage of the models on the page when talking about which fraction is more. Stress the fraction names for a whole. Can anyone name another fraction that is as much as $\frac{4}{4}$?

lesson Page 222

goal **Checkout**—writing a fraction to tell how much

warm-up No pencils—time for a little oral practice. Point to a model at random. *How many parts shaded? How many parts in all? How much shaded?* Point to another model and repeat the questions. For one example ask only the **how much** question. Pupils who can answer this question without the two guiding questions have mastered the concept of fractions.

page 222 Now is the time to use the pencils. Everyone should be working independently. Examine any errors. Try to determine the cause. Notice whether the pupil had trouble with only one of the three kinds of models.



STOP See activity 1, page 229a.

See activity 2, page 229a.

223

name _____

You ate $\frac{1}{2}$. I ate $\frac{1}{2}$.
How much did we eat in all?

$\frac{1}{2} + \frac{1}{2} =$ Accept $\frac{2}{2}$ or 1

You found $\frac{1}{4}$. I found $\frac{1}{4}$.
How much did we find in all?

$\frac{1}{4} + \frac{1}{4} = \frac{2}{4}$

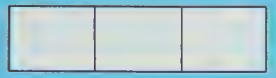
You get $\frac{2}{4}$. I get $\frac{1}{4}$.
How much do we get in all?

$\frac{2}{4} + \frac{1}{4} = \frac{3}{4}$

You get $\frac{3}{8}$. I get $\frac{4}{8}$.
How much do we get in all?

$\frac{3}{8} + \frac{4}{8} = \frac{7}{8}$

You get $\frac{1}{3}$. I get $\frac{1}{3}$.
How much do we get in all?



$\frac{1}{3} + \frac{1}{3} = \frac{2}{3}$

You lost $\frac{1}{6}$. I lost $\frac{2}{6}$.
How much did we lose in all?

$\frac{1}{6} + \frac{2}{6} = \frac{3}{6}$

© 1974, SRA

PURPOSE: Introduction to addition of fractional numbers.

lesson Page 223

goal Exploring the addition of fractions

memo This page is meant for pure exploration—to give the pupil a taste of the future and what can be done with fractions. Keep the development light.

things crayons of two colors

page 223 Have the children color the parts for each problem as they talk about them. Choose one color for **You** and another color for **I**. Relate the sentence at the right to the model. The shaded parts should help them complete the sentence.

lesson Page 224

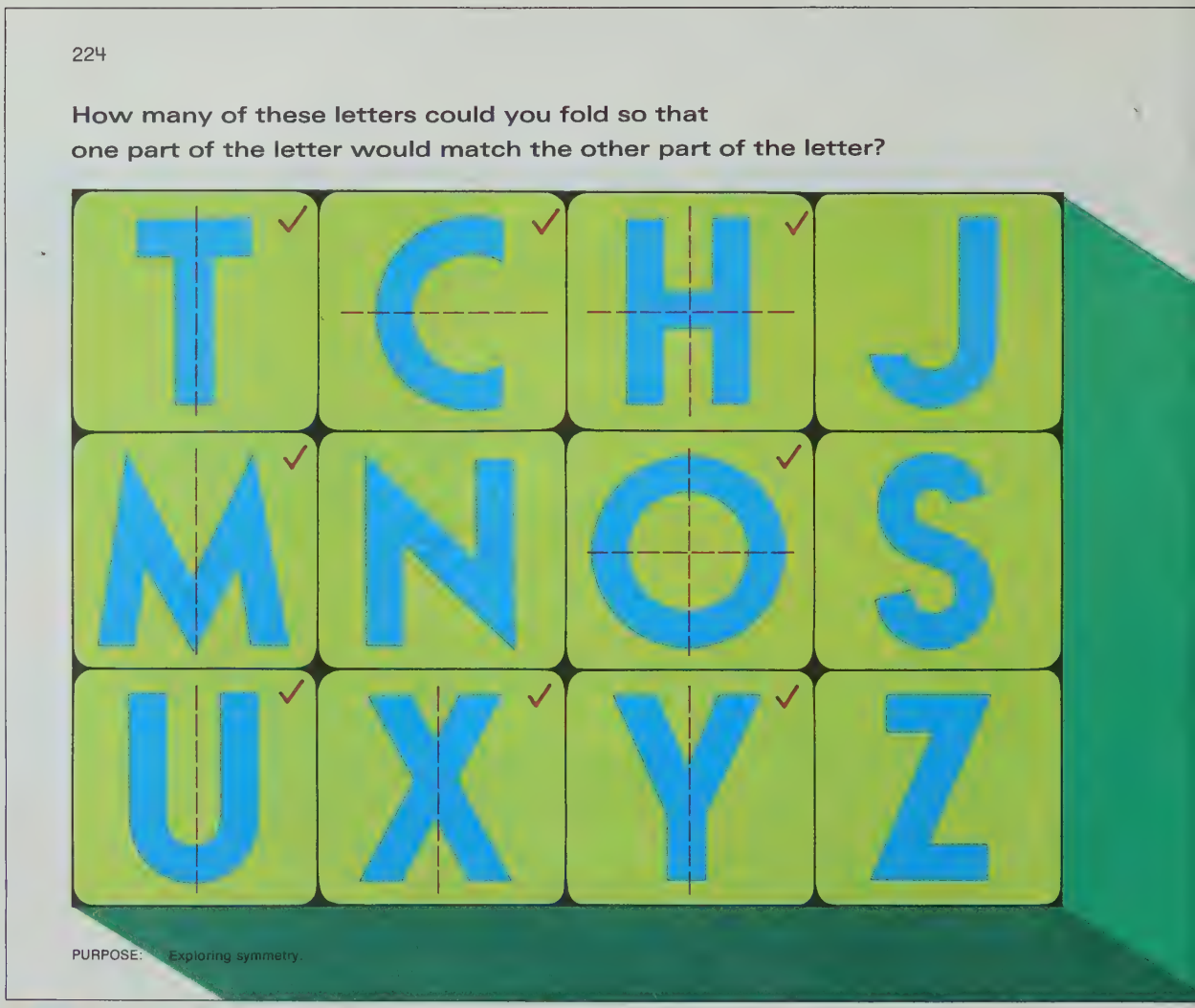
goal Exploring the concept of symmetry

memo The concept of one-half is extended with the exploration of symmetry. A shape has symmetry if it can be folded in half so that the two halves match.

things cutout objects (See page 256b.)
for each pupil:
piece of string or ruler

warm-up Cut out some objects such as leaves, hats, trees, hearts, and so on. Raid a coloring book if necessary. There should be no fold marks showing. If you have the patience, make one for each pupil. *Can you fold the shape you have in half in some way so that the two parts* **match***?* Don't cry as you see your labor mutilated. Think of the learning that is going on and **smile**. Examine the results. Which shapes could be folded so that the parts match, and which could not?

page 224 This is a difficult page for children who do not have good visual imagery. Read the question at the top of the page aloud. Look at the letter **T**. *Could you fold this letter so that one part would match the other part? Where would you fold it?* Try giving each child a piece of string to use or turn a ruler on its edge and place it on the imagined fold line. *Can you see the same thing on both sides?* Continue in the same way. Does the direction of the line change or remain the same? *Can your string (or ruler) be put down more than one way to show the same thing on both sides?*



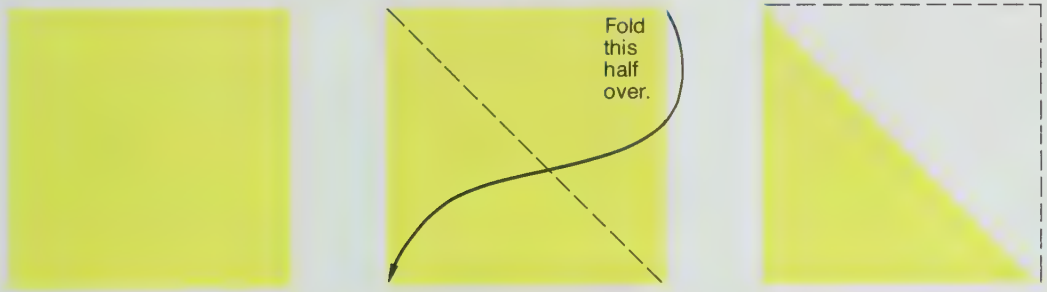
things folded sheet of paper

Have the children look at one another's faces and then place the edge of a folded sheet of paper from the middle of the forehead, along the tip of the nose, to the middle of the chin. *Is what you see on one side of the paper matched on the other side?* Hairstyles don't count.

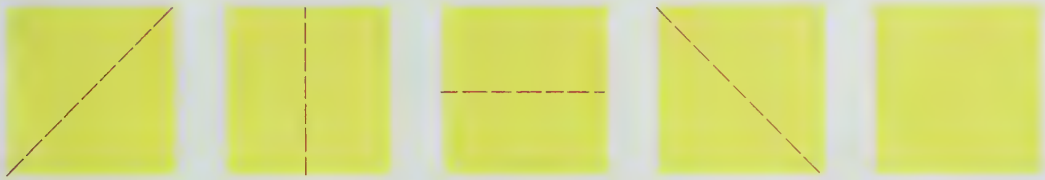
name _____

Find a square piece of paper or a square piece of cloth.
Maybe a square napkin will do.
How many ways can you fold it in half so that all the edges match?

INVESTIGATE



Mark the pictures below to show the folds you found.



© 1974, SRA PURPOSE: Exploring the symmetry of a square.

lesson Pages 225, 226, 227

goal Exploring the symmetry of a square

things for each pupil:
2 square pieces of paper
at least 3″ x 3″
crayons

page 225 The directions are all on the page. Go over them step by step. Help everyone get started.

Check by examining folded squares. Tease a little—but not too much. *Did anyone find another way?* One extra square is on the page. There are only four ways to fold a square to show symmetry. Prove this by giving each child another square of paper. *Fold your square once so that the parts match. Trace the fold with a red crayon.* Direct them to make a second fold. *Trace this fold with green.* Continue folding, using a different color to trace each fold line. When no more folds can be made, count the number of different colors.

goal Exploring the symmetry of a circle

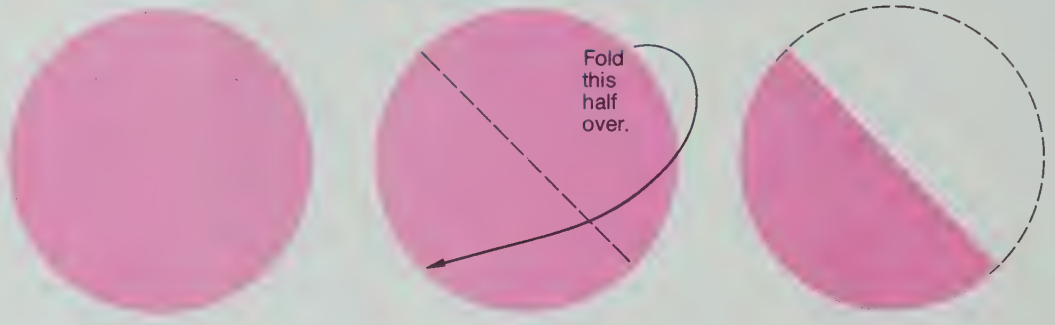
things for each pupil:
circular piece of paper
crayons

page 226 No coffeepot filters or round coasters? Have each child trace a can and then cut out the figure.

Follow the directions given on the page. Again, have the youngsters trace each fold line with crayon or a different color. Form small groups. Have the pupils compare their results. *How many folds did you find? Could there be more ways to fold a circle than anyone could count?*

Find a round piece of paper.
Maybe a filter for a coffeepot or a round paper coaster will do.
How many ways can you fold it in half so that all the edges match?

INVESTIGATE



All edges meet.

Mark the pictures below to show some of the folds you found.

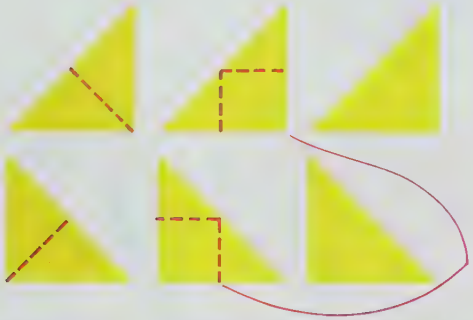
There are many more possible folds.

PURPOSE: Exploring the symmetry of a circle.

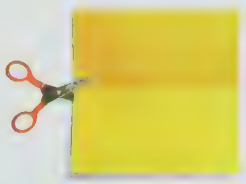
name _____

Cut a square piece of paper like this.

Use just one of the triangles.
How many ways can you fold the triangle so that all edges match?
Investigate.
Mark the pictures to show the folds.



Cut a square piece of paper like this.



Use just one of the rectangles.
How many ways can you fold the rectangle so that all edges match?
Investigate.
Mark the pictures to show the folds.

Some children may make these folds, but do not encourage them. All edges will match, but they do not show symmetry.

© 1974, SRA

PURPOSE: Exploring the symmetry of a triangle and of a rectangle.

goal Exploring the symmetry of a triangle and of a rectangle

things for each pupil:
2 squares of paper
scissors
crayons

page 227 Help with the directions on the page. Each fold line should be traced with a crayon of different color.

Have the youngsters get together in groups to check each others findings. What folds were found for the triangle? for the rectangle?

Look around the room. Can anything be found that would have two parts that matched if it could be folded? A stretched piece of string will help everyone visualize the fold line.

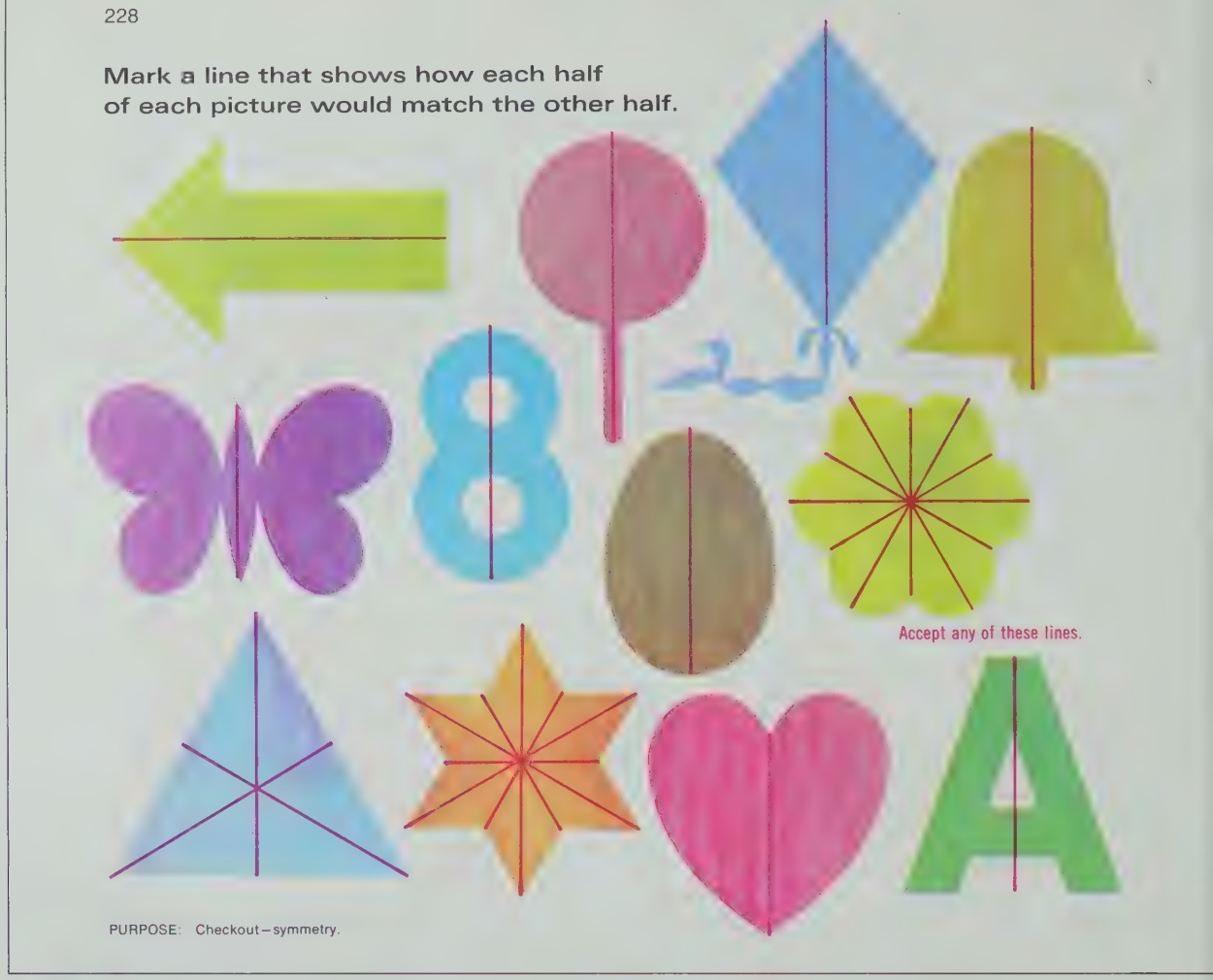
lesson Page 228

goal **Checkout**—finding symmetry in objects

memo Know before your pupils begin that for the most part their answers will not be marked exactly. Close is good enough. You're interested only in checking whether the pupil has the concept of symmetry. Remember, this section of the chapter was exploratory. The real test will come in level 3 after many more experiences.

things for each pupil: (optional)
straightedge
string

page 228 Talk about the directions. No hints are given as to where the line(s) may be. String or a straightedge may prove helpful. Unless the straightedge is transparent, it could be a hindrance for some children. Be alert for visual problems.


228
Mark a line that shows how each half of each picture would match the other half.
Accept any of these lines.
PURPOSE: Checkout—symmetry.

Look for symmetrical objects and designs on the youngster's clothing.

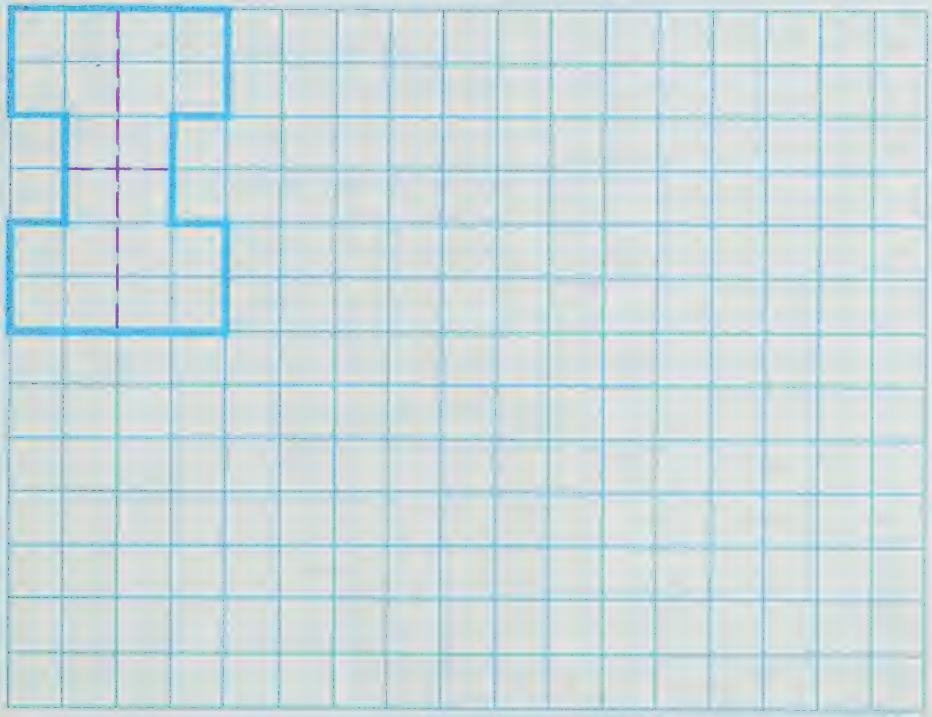
things construction-paper squares, rectangles, and triangles; sheets of paper, paste

Have everyone lay out a design in which one half matches the other half, and then paste the design on a sheet of paper. These designs make a great bulletin-board display.

name _____

Could you fold the design so that all edges would match? Yes

Make some more. Drawings will vary.



© 1974, SRA PURPOSE: Exploring symmetry.

lesson Page 229

goal Making symmetrical shapes

things crayons

page 229 Begin by having your pupils remember all the things they worked with that had two parts that matched. Talk about the shape shown on the page. Have them use a crayon to show where the shape could be folded. Did everyone mark the same line? Two folds are possible. Don't tell—let the youngsters find them both.

Now turn everyone loose to create designs. Encourage each person to use imagination. Have the youngsters get together in small groups to look at one another's creations. If possible, display the results.

things black construction paper, chalk, crayons

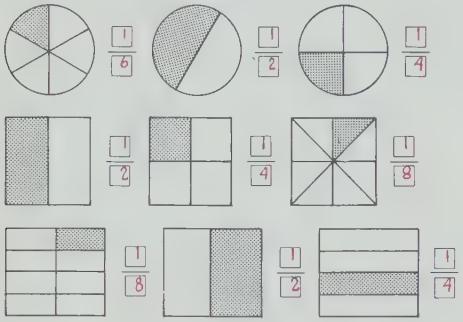
Pupils fold the construction paper in half the long way and open the paper after making the crease. Have them write their first name in manuscript letters with chalk, using the crease for a line. Fold the paper again and rub over the paper. The name should show on both sides of the fold, making a mirror reflection. Go over all the letters with a crayon and color all the closed spaces to make a design.

RESOURCES

another form of evaluation

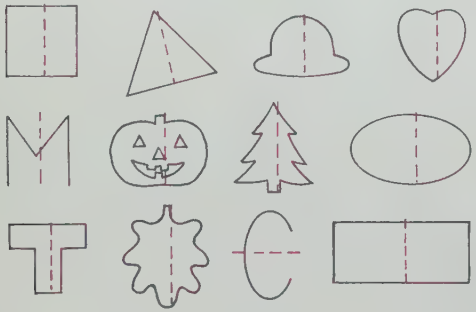
for checkout – page 222

Tell how much is shaded.



for checkout – page 228

Mark a line that shows how each half of each picture would match the other half.



activities

1. things for each pupil: 3 strips of adding-machine tape—all strips of the same length

Fold a strip so that the ends meet. Decide what fraction tells how much each part is and have the parts labeled. *Shade one part. How much is shaded? How much is not shaded?* Fold another strip into fourths and have $\frac{3}{4}$ shaded. Lay one strip above the other. *Which is more,* $\frac{1}{2}$ *or* $\frac{3}{4}$*?* The third strip is folded into eighths and $\frac{4}{8}$ is shaded. Compare with the other strips.

2. things set of colored rods or colored straws cut in related lengths

Compare rods of one color to those of another color. For the set you have, the yellow rod may be $\frac{1}{2}$ the length of the red rod. Have the youngsters make a display and label these relationships. When completed, the display can be used as reinforcement for other children.

additional learning aids

concept—chapter objectives 1, 5, and 6

SRA products

Mathematics Involvement Program, SRA (1971)
Cards: 263, 164, 224, 234
Skill through Patterns, level 2, SRA (1974)
Spirit masters: 30, 37, 44

other learning aids (described on page 256i)—Fraction Circles, Fraction Squares

notation—chapter objectives 2, 3, and 4

SRA products

Computapes, SRA (1972)
Module 5, Lessons: FR 1, 3
Mathematics Involvement Program, SRA (1971)
Cards: 21, 22, 282, 253, 323, 333
Skill through Patterns, level 2, SRA (1974)
Visual Approach to Mathematics, level 2, SRA (1967)
Visuals: 22, 23, 25

other learning aids—Fraction Circles, Fraction Squares, Visual Fraction Apparatus

letter to parents

Dear Parents:

Be ready to be really involved with mathematics at home. Our next study will be concerned with liquid measurement and telling time.

It's very hard for a child to understand that a quart of milk is still a quart if it is in a container other than a milk carton. We will be talking about and looking for all kinds of quart containers. You can help by showing your child all the things at home that are measured in quarts, pints, and gallons. The paint can, the bottle of bleach, even the package of ice cream will help your child understand that the measurement of a quart, for example, has very little to do with the looks of the container.

Reserving a time at the kitchen sink with all kinds of containers and colored water will offer a rich learning experience. (With luck you or your child will not have the experience of seeing what a quart of liquid looks like when it is spilled on the floor!)

Learning how to tell time isn't as easy as it used to be. The need to read a clock certainly is great, but there are so many different kinds of clocks. Our goal is to read the clock to the nearest 5 minutes and learn how to record time too. You will soon be able to expect your child to

read the clock when it says 5, 10, 15, 20, 25, or 30 minutes after the hour as well as 25, 20, 15, 10, or 5 minutes before the hour. Your child will of course need a clockface with all the numerals shown. A digital clock or a clockface with roman numerals comes at another level.

It may be that your youngster also will develop a special interest in the calendar. If you have a calendar for birthday and anniversary reminders or for appointments, it would be good to take some time to talk about them.

After our study of time we will begin a review of all the things we have studied this year. It's always fun to look back and see the progress that has been made. Your child should be especially proud of those new addition and subtraction skills.

These might help.

© 1974, SRA Permission to reproduce for school use.

12 MEASUREMENT

before this chapter the learner has —

1. Developed an understanding of the words **measure** and **measurement**
2. Shown addition on the number line
3. Told time to the hour

in chapter 12 the learner is —

1. Exploring whether the shape of a container changes its capacity
2. Comparing units of liquid measure—pint, quart, and gallon
3. Telling the number of minutes after or before the hour when the minute hand points directly to a number on the clockface
4. Recording time, using time notation
5. Mastering naming the time when the hands show half past the hour
6. Reading the calendar for a specific month and mastering telling the day of the week on which a specific date falls

in later levels the learner will —

Master reading the time to the nearest 5-minute interval

Notes & Things

This chapter introduces the study of liquid measure to the youngsters and then goes on to extend their learning about time.

It will not be easy for the children to accept the fact that a litre or quart, for example, is a standard unit of measure as it was for them to accept the centimetre as a standard unit of measure. A quart of liquid can fit into so many different shaped containers. In fact, it's really rather hard to believe that a quart of paint—let alone a quart of sand—could (or should) fit into a quart milk carton. The youngsters will need to have a collection of various-size milk cartons to compare. And the pouring experiences are important. Hope for a nice day and conduct these activities on the playground if you fear the inevitable spills in the classroom.

Unfortunately there aren't many containers in the grocery store that are marked in litres. Don't worry—the youngsters will have lots of experiences with this unit of measure in later levels. For now, your task is to present the idea of pints, quarts, half-gallons, and gallons. It's obvious that the dairy case at the grocery store can now serve an unusual function.

We know that the majority of children's experiences with the clock far exceed the learning expected at the end of level 1. After all, the ability to tell time to the hour simply isn't enough to let one know when a favorite TV program is on. In this chapter reading the clock to minutes before or after the hour will be the easy part. Recording the time the clock shows is quite another thing; be patient as you go about the task. Remember, the child sees the little hand pointing to 9 and the big hand pointing to 11, hears the words "5 minutes 'til 9," and then has to write 8:55!

The pages present the material in sequence. The idea that the minute marks shown on the clockface are a sort of curved number line helps get the job done. You will have lots of excuses for extra practice in the ordinary school day. And the quick look at the calendar will be equally as easy to work with. You may be surprised at how much fun these learning experiences will be.

words

Concept-development words introduced in this chapter are listed in the order in which they are used orally. Those words that also appear on pupil pages are marked with an *.

containers*
quart*
pint*
gallon*
calendar*

things

quart containers
powdered fruit drink
milk containers—half pint, pint, quart, half gallon, gallon
demonstration clock
timer, stopwatch, or clock with a second hand
practice clockfaces for each pupil
1-year calendar

For the extra activities you will want to have these things available:
- circle compass
- containers with snap-on lids, paper fasteners, and clock hands for each pupil
- various-shape containers for liquids

lesson Page 230

goal **Survey**—knowledge of liquid measure

page 230 Everybody get together and talk about this page. Ask questions. Listen to find out how much your pupils already know about measuring liquids.

What does the girl have in her hand? You've used a ruler. What did you use it for? What do you think she wants to measure? What things in the picture could she measure with a ruler?

Could she measure how much water is in the fishbowl with a ruler? Why not? Water is a liquid. What is a liquid?

Have you ever seen a person measure a liquid? What liquid did he measure? The answers may range all the way from cooking to buying gasoline. List the answers on the board. *What did the person use for measuring?* Make another list. This is the children's list—no suggestions from you now.

Stress the last line on the page. This is each person's learning goal for the chapter.

230
You can measure lots of things.
You know how to use a ruler.
But can you use a ruler to measure this?
Learn how to measure liquid, too.
PURPOSE. Introduction to liquid measurement.

231

name _____

Answer the questions.

Are the shapes of the containers the same?	No	Are the containers filled with the same stuff?	No
Would an empty quart lemonade bottle hold the quart of paint?	Yes	Could a quart of water be poured into any of the quart containers?	Yes
Would an empty quart milk container hold the quart of oil?	Yes	If you filled a quart container with water, about how much water would be in the container?	one quart

© 1974, SRA PURPOSE: Awareness of the fact that capacity is independent of shape.

Everyone is a detective. Find and bring to school a container of any shape you can find marked $\frac{1}{2}$ pint, 1 pint, 1 quart, $\frac{1}{2}$ gallon, 1 gallon. Keep the collection coming in. You'll need activity 2, page 246a.

lesson Page 231

goal Developing an awareness of the fact that capacity is independent of shape

things quart containers
powdered fruit drink

warm-up Examine various quart CONTAINERS. How are they alike? How are they different? Don't expect the youngsters to know that each container will hold a QUART of liquid. This can be shown quickly by mixing a powdered fruit drink, filling one of the containers, and then pouring from one container to another. If you want to make your point, be careful not to spill. Once everyone realizes that the same amount of liquid can be poured into many different shapes, drink up the proof.

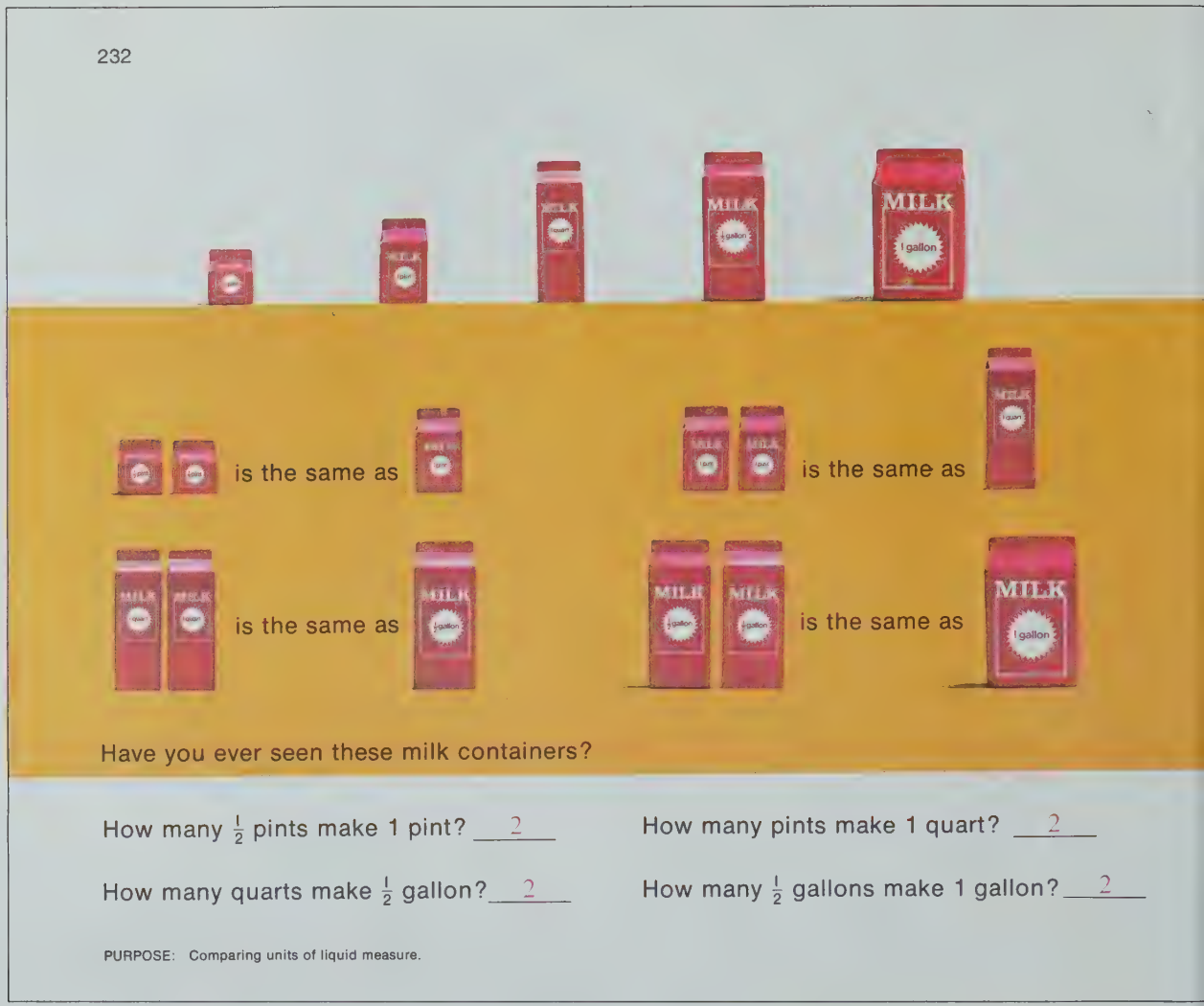
page 231 The questions on the page relate the warm-up activity to the real world and summarize the activity as well. Read, discuss, and share ideas.

lesson Pages 232, 233

goal Comparing units of liquid measure

things milk containers: half pint, pint, quart, half gallon, gallon

page 232 Match the pictures with actual containers. Introduce the measures PINT and GALLON if the children don't already know these words. Pouring two half pints into a pint container, two quarts into a half gallon container, and so on may get to be a little messy; but it will sure prove that these quantities are equivalent. Talk about where the children have seen or used each of the different containers.


232
MILK
1 gallon
is the same as
is the same as
is the same as
is the same as
Have you ever seen these milk containers?
How many $\frac{1}{2}$ pints make 1 pint? 2
How many pints make 1 quart? 2
How many quarts make $\frac{1}{2}$ gallon? 2
How many $\frac{1}{2}$ gallons make 1 gallon? 2
PURPOSE: Comparing units of liquid measure.

You and the milkman have the same amount.

name _____

Match

Fill in the blanks.

YOU	THE MILKMAN
2 pints	1 quart
2 quarts	4 pints
1 gallon	4 quarts
6 pints	3 quarts
4 quarts	2 half gallons
3 pints	6 half pints
8 half gallons	4 gallons
6 pints	3 quarts

© 1974, SRA

PURPOSE: Comparing units of liquid measure.

goal Comparing units of liquid measure

page 233 Complete the left half of the page before tackling the right half. On the right side, make sure the children read straight across each line. They may need to use a piece of paper to block out all lines below the one they are working on.

The emphasis should not be on memorizing a table of measures, but rather on becoming familiar with equivalent amounts of liquid through real-life experiences.

lesson Pages 234, 235

goal **Survey**—ability to tell time

page 234 How much your pupils already know about telling time you can find out here. That means lots of questions and lots of listening.

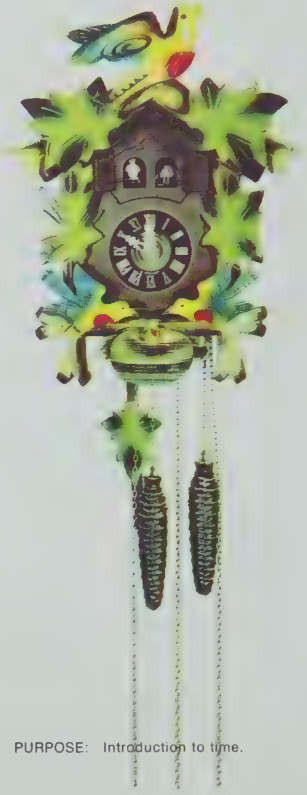
The children will want to tell where they've seen at least one of the clocks pictured. Do any children know the special names for the different kinds of clocks? If anyone is wearing a watch, add it to the discussion. *Have you ever seen a clock or a watch that is really different?* If you have a landmark clock in your area, include it in the discussion.

Clocks may look different, but they all do the same thing—record time. *What might happen if we had no clocks or watches? How would you know when to come to school?*

Focus attention on the time shown on the clocks, and ask an appropriate question for each. *Which clock tells when you could go to the store? when it's time to get ready for lunch?*

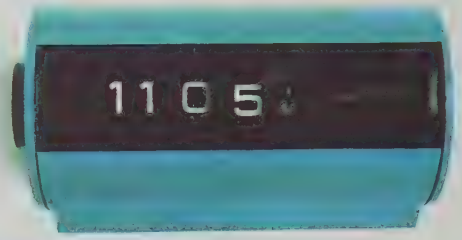
How many numerals on a clock? How many hands? Are the hands alike? What does the **shorter** *hand tell? What does the* **longer** *hand tell?*

Have you ever seen a clock that looks like this?



Or one like this?

Or like this?



Or like this?

They all measure time.

Look at the clock on your wall. What time is it?

PURPOSE: Introduction to time.

name _____

What time is it?

1 o'clock

8 o'clock

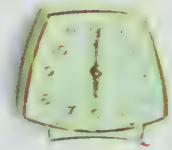
9 o'clock

10 o'clock

11 o'clock

12 o'clock

7 o'clock



6 o'clock

3 o'clock

© 1974, SRA

PURPOSE: Review of telling time on the hour.

goal Review of telling time on the hour

things demonstration clock

warm-up What could happen in an hour's time? *Do we have 1 hour for lunch on a school day?* Let everyone begin to sense the length of 1 hour. Sometime during the day draw attention to the room clock when it's on the hour. *What time is it? I wonder how much we can get done in an hour? Let's check an hour from now.* At least five people will probably tell you when the hour is up. You might set a timer to remind you.

page 235 *What question are you being asked?* Determine whether your pupils know anything about telling time before assigning the page. *What time does the tall clock say?* Does anyone know a special name for this kind of clock? Ask to what number the longer hand is pointing for each clock. *Does this tell you something special? What does it say under each picture? Why? Point to the clock that says 6 o'clock.*

From your pupils' responses decide who needs to first spend some time working with you and a demonstration clock and who is ready to complete the page independently.

lesson Pages 236, 237

goal Readiness for reading minutes on a clock

things timer, stopwatch, or clock with a second hand

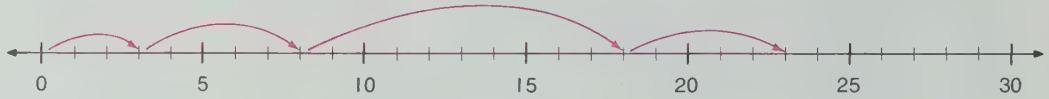
warm-up Provide some experience in estimating a minute. *How long do you think a minute is?* Use a signal to begin. Direct the children to raise a hand when they think a minute has passed. Use a timer, stopwatch, or clock with a second hand to time an actual minute. Do this several times so that the children can develop a **feel** for the length of a minute. You might even have some addition and subtraction fact sheets available, and they can find out how many problems they can do in 1 minute.

page 236 Treat this as a puzzle page. Have the first puzzle read aloud. *Try to figure out the answer by yourself. Use the number line to help you.* As the children work, duplicate the number line on the chalkboard. Have someone show how to figure out the answer. Use the same approach for the second puzzle.

Before leaving the page talk about the number lines. *How many minutes are shown on the number line? Anyone have an idea why?* If the children have no answer, drop it with, *Maybe we'll find out later.*

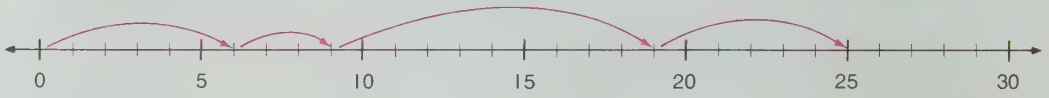
On the number lines you've used before, the dots have all been the same size. Look at these number lines. Which dots are larger? Anyone know why? If not, again suggest they may find out later.

Add the minutes on the number line.



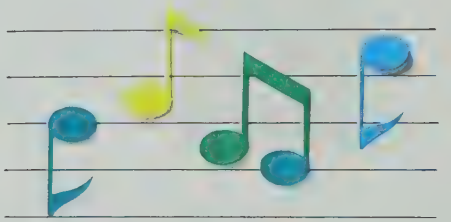
Charlie took 3 minutes to brush his teeth.
He took 5 more minutes to get dressed.
He took 10 minutes to eat his breakfast.
He took 5 minutes to find his coat.

How long did it take Charlie
to get ready to go out the door? 23 minutes



One song lasted 6 minutes.
A flute solo took 3 minutes.
The band played for 10 minutes.
A piano piece took 6 minutes.

How long did the music last? 25 minutes

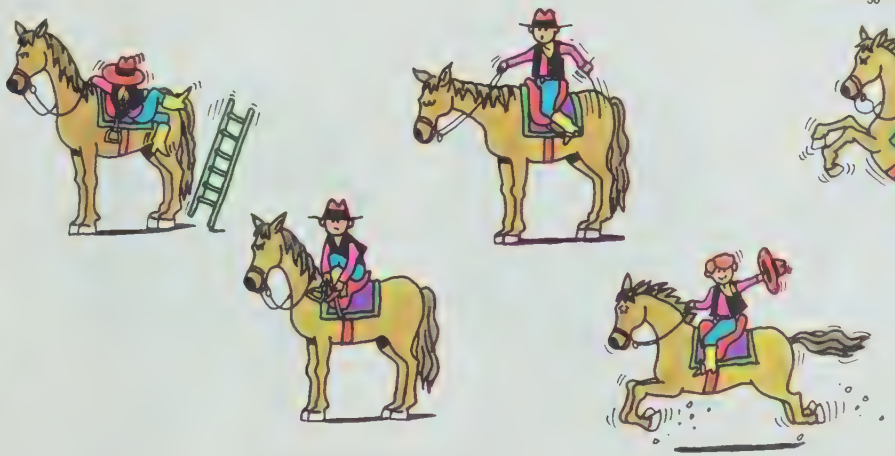


PURPOSE: Readiness for reading minutes on a clock.

name _____

Add the minutes on the number line clock.
Bennie spent 9 minutes getting on the horse.
He spent 7 minutes placing his feet in the stirrups.
He spent 8 minutes getting the horse to move.
He spent 2 minutes riding.
He spent 0 minutes falling off the horse.

How long did Bennie's adventure last? 26 minutes



© 1974, SRA

PURPOSE: Practice in telling time.

goal Introduction to reading minutes on the clock

page 237 *You know a lot about telling time with the shorter hand of a clock. Now it's time to find out what the longer hand tells and does.* Draw attention to the clock shown. *What's wrong with this clock?* Have the children decide what hour the clock should read and make the shorter hand.

Do you see a number line that goes to 30? Where? What happened to the straight number line from the page before? Are the dots all the same size? Which dots are bigger? How does this help you count? Compare the clockface shown with your classroom clock. How are the minutes shown on that clock?

Where is the zero on the number line? What number is that on the clock? Pretend the hour hand is moving. *If the minute hand moves from 12 to the first dot, how many minutes have passed? From the first dot to the second dot? When the minute hand reaches the 1 on the clock, how many minutes will have passed? When it reaches the 2 on the clock?* Continue through the 6. *Why are there big and small dots on the number line?*

Read the puzzle aloud. Have the pupils use the curved number line as they did a straight one to help them find the solution. Have them tell how they figured out the answer.

lesson Pages 238, 239

goal Showing minutes after the hour

memo Pages 238 and 239 should be completed on the same day.

things crayons

page 238 Ask the question and have the pupils record the time on each clock. Check to make sure everyone can read time correctly to the hour.

Review the difference in length of the two hands and what each hand shows. If you think it necessary, have the children label the two hands. *How many minutes for the longer hand to move from the 12 to the 1? from the 1 to the 2?* Continue to the 6.

Pretend that the longer hand can move. Make a long red hand pointing so that the clock says 5 minutes after 9.

Keep the long minute hand moving. Have the children make a green minute hand pointing so that the clock says 10 minutes after 9. Continue for 15 minutes after 9, 20 minutes after 9, and 25 minutes after 9—using a different color each time. Go right on to page 239.

238

WHAT TIME IS IT?

9 o'clock

4 o'clock

10 o'clock

1 o'clock

PURPOSE: Telling time on the hour, using a clock showing minutes.

See activity 1, page 246a.

name _____

How many minutes after 9:00?

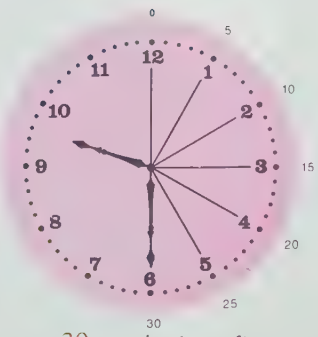
5 minutes after

10 minutes after

15 minutes after

20 minutes after

25 minutes after



30 minutes after

© 1974, SRA

PURPOSE: Reading minutes after the hour.

goal Reading the number of minutes after the hour

page 239 Focus on the first clock. Point to the hour hand. *What job does this hand do?* Point to minute hand. *What is this hand's job? What hour does this clock show? To what number is the minute hand pointing? How many minutes after 9 is that?* Have the answer written in the blank. *Here's how we read the time on this clock.* Have the phrase below the clock read.

Telling time is an important skill. Continue to work right with the children. For each clock ask how many minutes after 9 the clock shows.

lesson Pages 240, 241

goal Introduction to time notation

memo Writing the time involves a new notation. Imagine how confused a child can become when he says and hears 5 minutes after 9, yet is confronted with recording 9:05. Take time to talk about the zero that so magically appears.

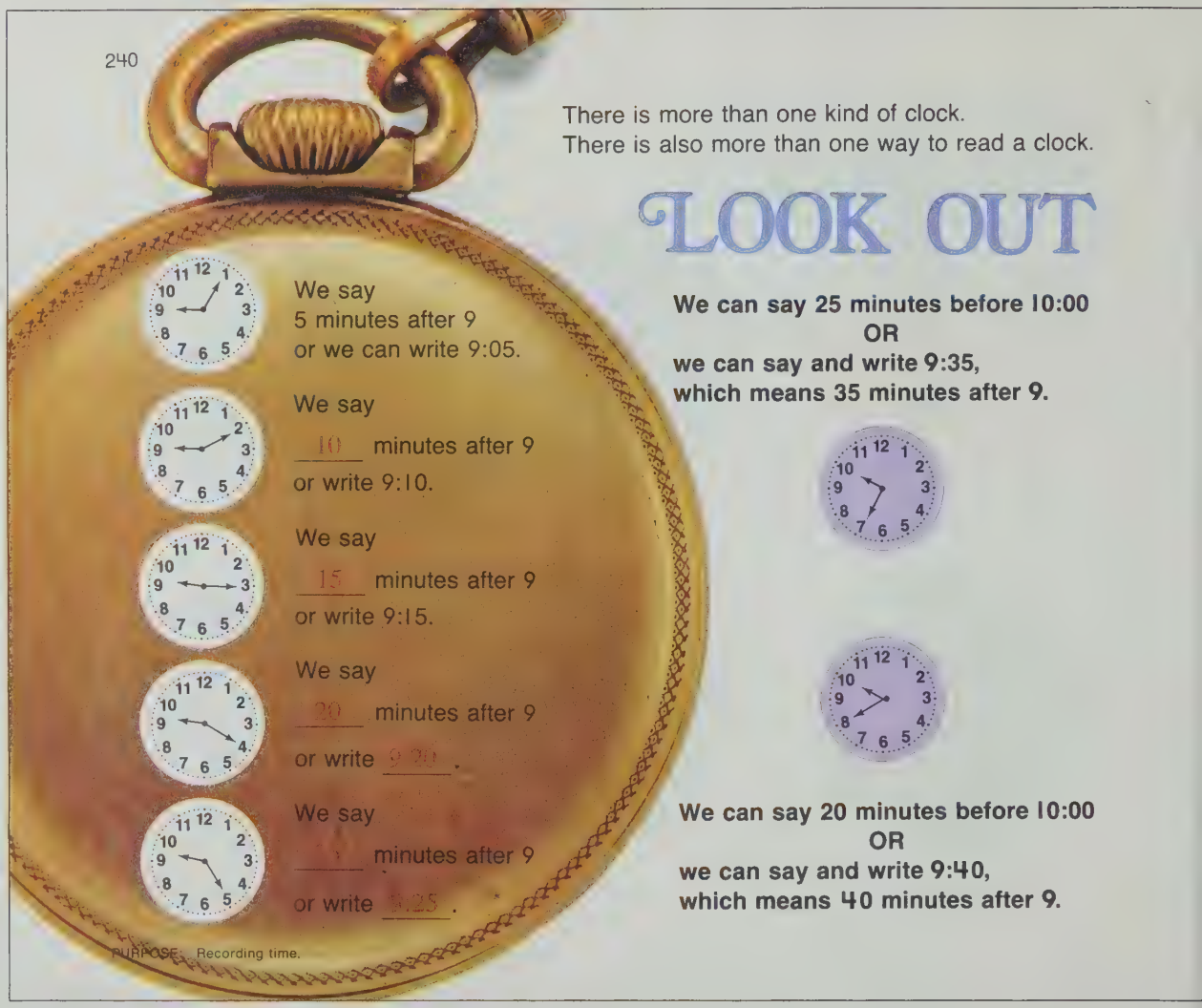
page 240 Two big ideas are presented:
- Time notation
- Reading time *after* the hour and *before* the hour.

Take the ideas separately.

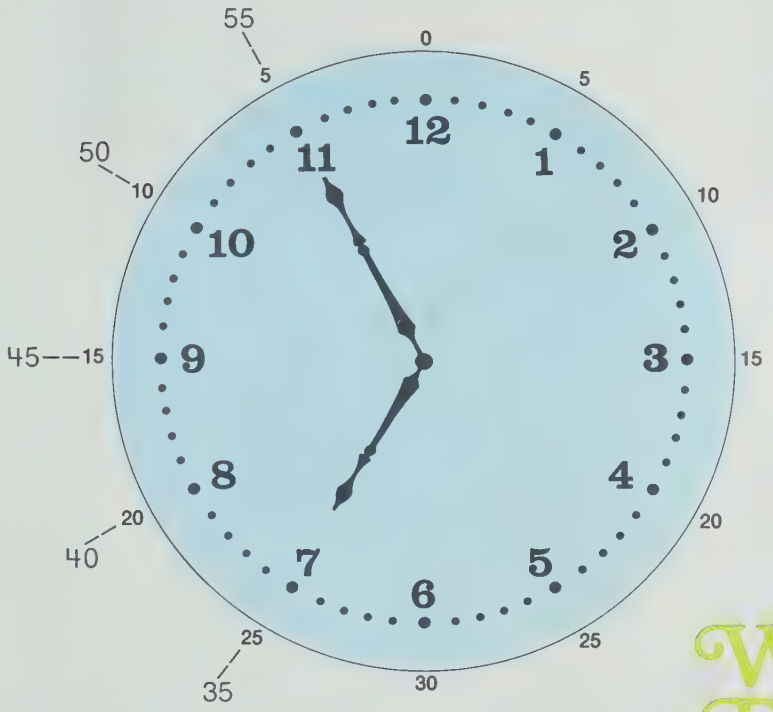
Time notation is similar to money notation. Dollars are separated from cents by the decimal point. Two places are used to record cents. Similarly, the hour is separated from the minutes by a colon. Two places are usually used to record minutes. Recording 5 cents and 5 minutes presents a parallel problem.

Work through the first 3 problems together. Have the youngsters try the next one on their own. Check before having them go on.

Talk about the **Look out!** section on the pupil page. *Can you figure out how we can say 25 minutes before 10 o'clock?* Give an opportunity for discovery; do not explain now. Instead, go right on to the next page.



name _____



One person could read this clockface as 5 minutes before 7.

Another person might say the clock shows 6:55, which means 55 minutes after 6.

WHO IS RIGHT?

Both are right.

© 1974, SRA

PURPOSE: Practice in telling time.

goal Reading the number of minutes before the hour

page 241 *What has happened to the number line around the clock? How many minutes after 6 does the clock show?* Count by 5s from 5 through 55, going in a clockwise direction. Run a finger from 12 to 6 using a clockwise motion as you say, *You've had lots of practice with minutes after the hour going this way.* Run a finger from 12 to 6 in a counterclockwise direction as you say, *When we count minutes on this half of the clock, we can also count the number of minutes before the next hour. How many minutes before 7 does the minute hand show?*

Take lots of time to practice with this new idea. Do some pretending. *Pretend the minute hand is pointing to the 10. How many minutes before 7 o'clock? How many minutes after 6 o'clock?* Stick with the multiples of 5. Pretend the minute hand is pointing to the 9, the 8, and finally the 7. Then go back and have the statements on the page read aloud and the questions answered.

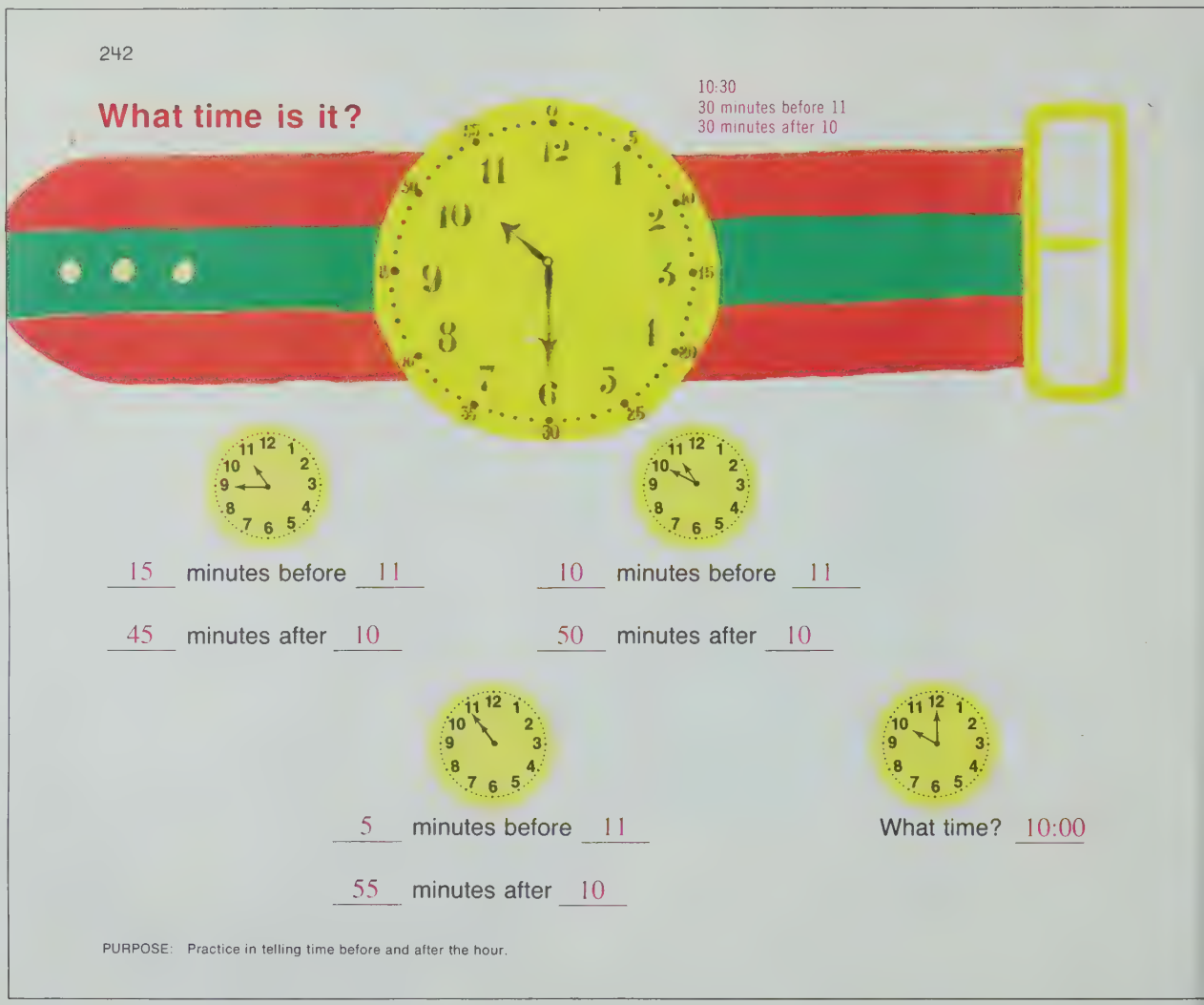
lesson Pages 242, 243, 244

goal Practice in reading minutes before and after the hour

things demonstration clock
for each pupil:
practice clockface
(See pages 246b and 256c.)

warm-up Review reading minutes before and after the hour with the demonstration clock. Extend the practice by having the pupils put the hands on their individual clocks to a specific time. *Make the clock hands say 15 minutes* **before** *8. How else can you read this? Make the clock hands say 35 minutes* **after** *3. How else can you read this?*

page 242 *How is the number line on this clock different from the one on the last page?* Work with your pupils until they can handle this skill with confidence.



name _____

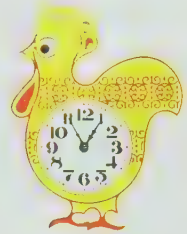
What time is it?

We cay say

_25_ minutes before _3_

or _35_ minutes after _2_ ,

but we write _2:35_ .

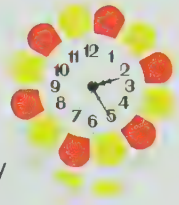


We can say

_5_ minutes before _1_

or _55_ minutes after _12_ ,

but we write _12:55_ .



We can say

_35_ minutes before _3_

or _25_ minutes after _2_ ,

but we write _2:25_ .

We can say

_30_ minutes before _11_

or _30_ minutes after _10_ ,

but we write _10:30_ .

© 1974, SRA PURPOSE: Telling time before and after the hour.

goal Practice in reading and recording the time

things for each pupil:
practice clockface

warm-up Provide practice with the individual clocks as on the preceding page, but add one more step. *Make your clock say 15 minutes before 10. How else can you read that? This is how to write 45 minutes after 9.* Write 9:45 on the board. *We always write the number of minutes* **after** *the hour.* Have a pupil record the time for each practice example.

page 243 Complete at least the first two problems together. Have the youngsters try the third problem independently. Check results.

Decide which pupils are ready to proceed on their own and which pupils need your guidance.

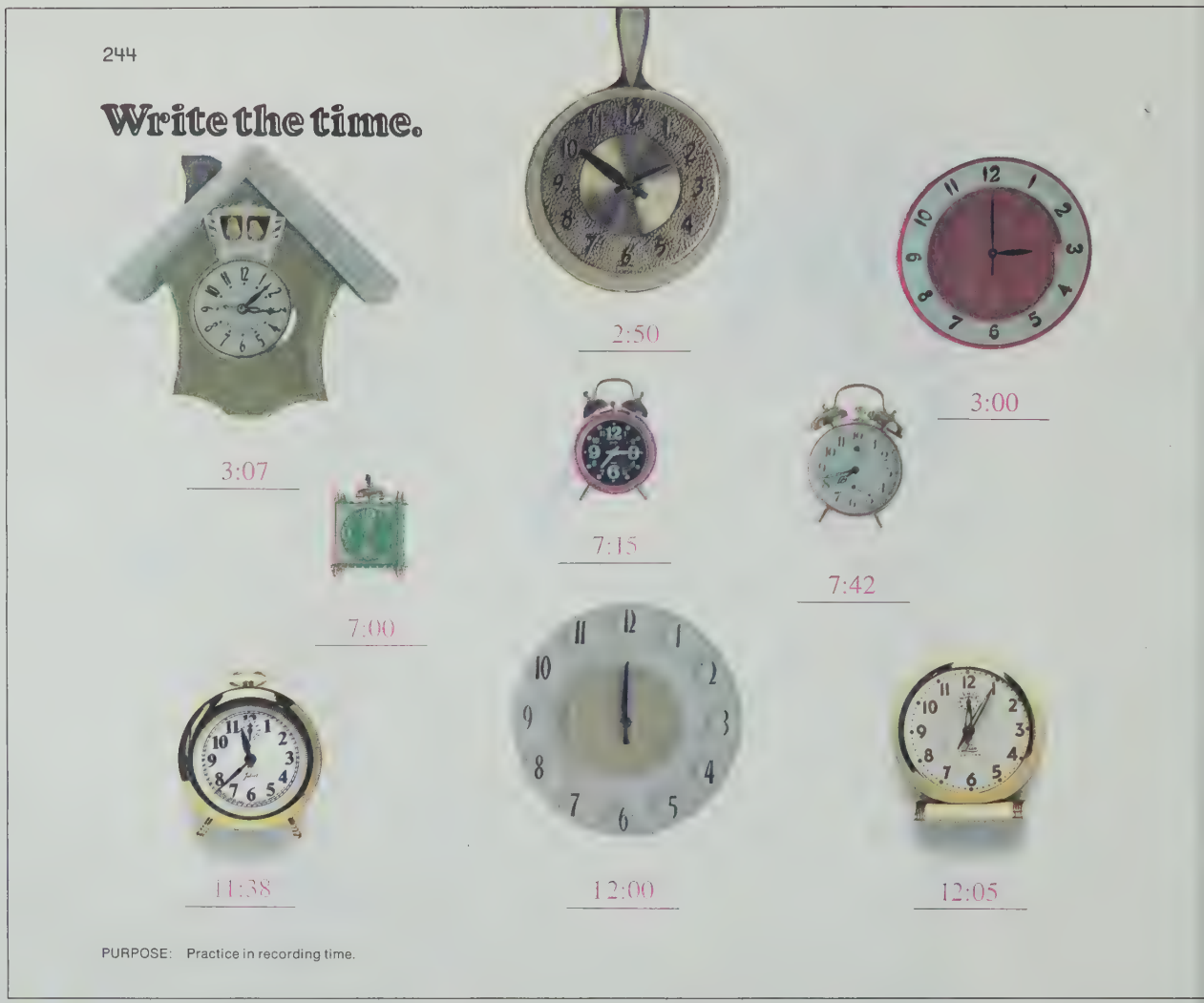
goal Practice in recording the time

warm-up Use a demonstration clock and explore reading the time when the minute hand is 1 minute after the hour; 2 minutes after the hour; then 3, 4, and 5 minutes after the hour. Work to get the youngsters to understand that the number of minutes going clockwise from the hour are very much like numbers on a curved number line. Each mark represents one more minute even though the numeral may not be recorded next to that mark.

Let the children work in pairs with their own clocks and practice, practice, practice. Change partners and practice some more.

page 244 Two skills are practiced:
- Reading the time
- Recording the time

Have the children first tell you the time shown on each clock. Where two verbal answers are possible ask for both. Then concentrate on recording the time.
Work the first row together. Then let everyone work independently. Identify pupils who need more practice before the Checkout.



Keep a time sheet of a day or a week at school.
9:00 School begins
9:15 Reading
10:00 Music

Let the children design their own forms for recording the information. You may want to display the forms for comparison.

name _____

How many hours in one day? 24

How many days in one week? 7

How many weeks in one month? Between 4 and 5

Make a calendar for this month.
Answers will vary. An example is given in parentheses.

What year is this? (Current year)

What month is this? June

What day is today? _____

What is today's date? _____

Complete the calendar.

(June)

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
					1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30

Does each month always look the same on a calendar? No

© 1974, SRA PURPOSE: Practice with the calendar.

lesson Page 245

goal Reading the calendar

things 1-year calendar
(See page 256e also.)

page 245 Read and answer the first three questions together.

Before the CALENDAR can be completed a very important question must be answered. *On what day of the week did this month begin? Let's make sure everyone writes the numeral 1 in the correct box before filling in all the boxes.* You may want to have the youngsters record the weather for each day of the month with a small picture for each day—sun, clouds, rain (umbrella), and so on. *Does someone have a birthday this month? On what day will the birthday be? How many school days are left this month? How many Saturdays?* Make certain everyone can name the days of the week.

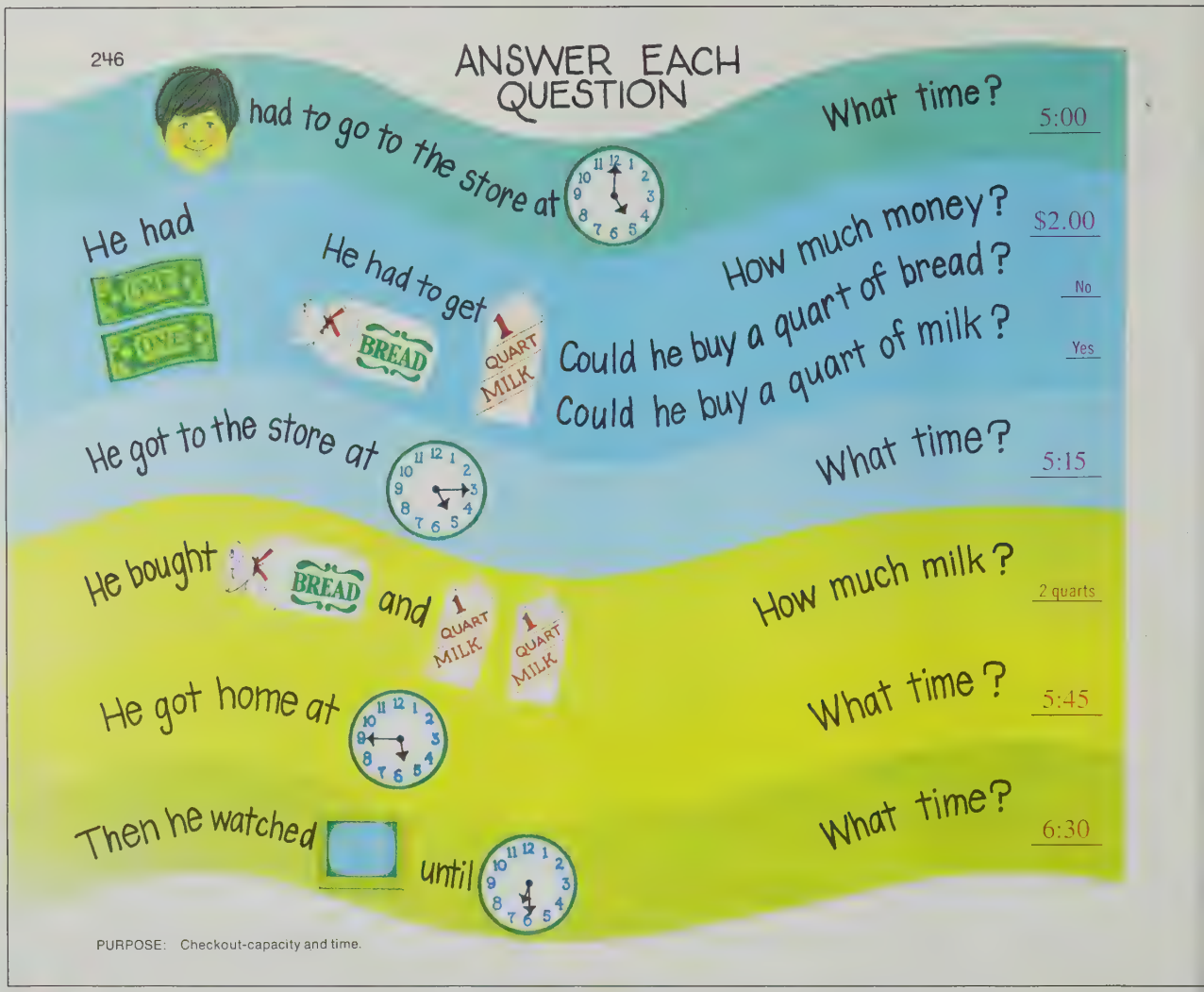
Back to the questions on the page. Compare the pupil-made calendars to each month of a 1-year calendar before answering the last question.

lesson Page 246

goal **Checkout**—measuring capacity and time

page 246 The page relates measurement to the pupil's world. Don't let words stand in the way of success. Give all the help needed. All answers should be written independently.

Examine any errors for cause. Recheck the child who does not record the time correctly. Can the time be stated orally? Then the problem is one of recording. The ability to tell time is more important than the ability to record time for the present.



things clockface with movable hands

Show me the time school begins.
What time is that?
Show me the time to go to lunch.
What time is that?
Continue with other appropriate times.

See activity 2, page 246a.

RESOURCES

another form of evaluation

for checkout—page 246

Mike had $1 25¢ 10¢ 10¢ 5¢ to spend for JoAnn's birthday present. How much money? $1.50
He wanted to buy BEAD SET $1.25
Could he buy it? Yes
JoAnn's party began at what time? 1:30
They played games until what time? 2:15
There was and to drink.
How much orange drink? 3 quarts
JoAnn opened her presents at what time? 2:45
Everyone went home at what time? 3:00

activities

1. things felt pen, circle compass; for each pupil: container with snap-on plastic lid, paper fastener, clock hands

Write numerals on the plastic lid with a felt pen to form a clockface. Punch a hole in the center with the point of a compass. Attach the clock hands with a paper fastener. Everyone's ready for practice.

Variation: Each pupil can trace the lid of his container on construction paper, write the numerals to form a clockface, cut it out, and fit it into the lid. These clockfaces can be decorated to make more interesting clocks.

2. things various-shaped containers for liquids

Project: Sort the containers, making a set for each quantity. Label each group appropriately.

Did you find some containers for liquids that are marked in some other way? Many containers come marked in metric units. This is not for study—just for exploration.

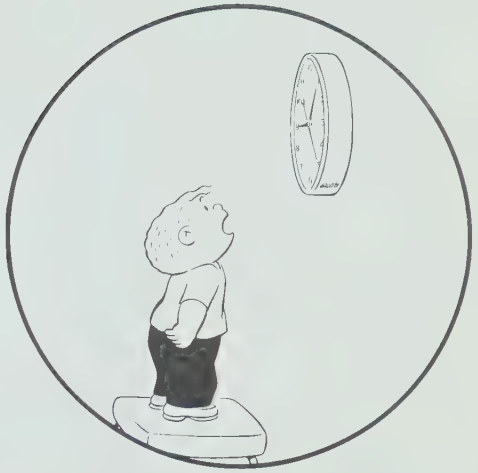
additional learning aids

concept—chapter objectives 1, 2, 3, 4, 5, and 6

SRA products

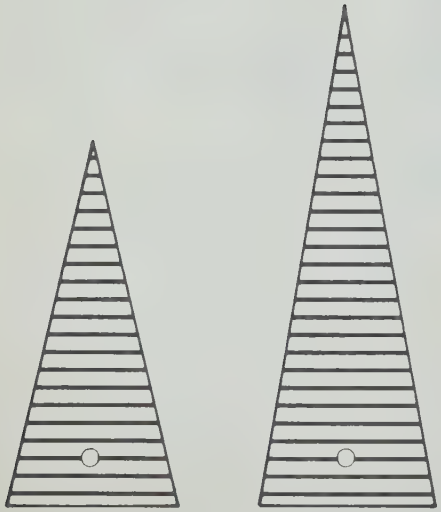
Skill through Patterns, level 2, SRA (1974)
Spirit master: 34
Visual Approach to Mathematics, level 2, SRA (1967)
Visual: 14

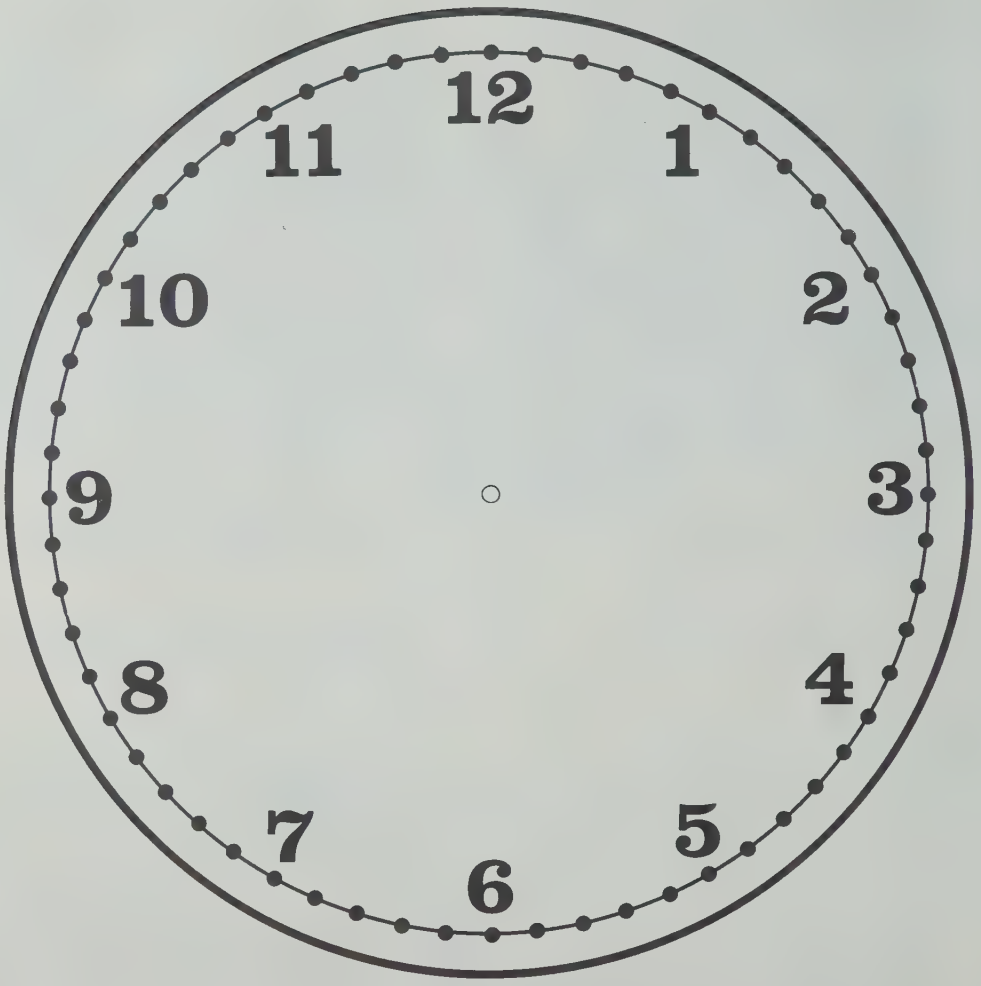
other learning aids (described on page 256i)—Judy Clock, Judy Mini-Clocks, Volume Relationship (Set 1)



"The big hand's on one and the little hand is on nine and the red hand is on two, three, four, five . . ."

The Family Circus by Bill Keane, reprinted courtesy of The Register and Tribune Syndicate





© 1974, SRA Permission to reproduce for school use.

13 REVIEW AND EXTENSION

before this chapter the learner has —

1. Mastered finding the sum for any two 2-digit numbers
2. Mastered saying or writing the difference for any subtraction fact
3. Mastered finding the difference for any two numbers less than 100

in chapter 13 the learner is —

1. Reviewing the addition and subtraction skills developed and mastered in this level
2. Reviewing the addition of two 3-digit numbers, no renaming
3. Extending addition skills to thousands, no renaming
4. Subtracting a 2-digit number from a 3-digit number, no renaming
5. Becoming familiar with arrays for multiplication
6. Finding how many in an array by repeated addition

in later levels the learner will —

1. Add and subtract 3-digit numbers with renaming
2. Be introduced to multiplication

Notes & Things

This chapter will provide a quick review of the addition and subtraction covered in this level and, more important, will let the children show just how smart they really are. They will get a chance to add some really big numbers and have time to put their skills to a brand-new use.

Multiplication as a concept is not introduced until the next level. The experiences with arrays provided are the perfect readiness activities for that concept.

You should feel as happy and proud as the youngsters do.

Congratulations for a job well done!

name _____

Aren't you proud? You have learned so much!

You know how to add little numbers.

Skill: Basic addition facts

9 + 1 = 10	8 + 2 = 10	3 + 9 = 12	7 + 4 = 11	6 + 6 = 12	9 + 2 = 11
7 + 6 = 13	7 + 8 = 15	8 + 8 = 16	9 + 6 = 15	4 + 6 = 10	7 + 9 = 16

You know how to add BIG numbers.

Skill: Addition with renaming

14 + 40 = 54	70 + 22 = 92	31 + 37 = 68	43 + 40 = 83	85 + 14 = 99	41 + 26 = 67
56 + 26 = 82	79 + 2 = 81	45 + 19 = 64	63 + 25 = 88	37 + 16 = 53	58 + 37 = 95

© 1974, SRA

PURPOSE: Review of addition.

lesson Pages 247, 248

goal Review of addition with 1- and 2-digit numbers

page 247 Share your pride in the children as the sentences on page are read. Take time for some discussion. Do they remember what it was like way back on the first day of this school year? Have they changed any? In what ways? Make a list of some of the things they remember learning and **not** just in mathematics! Each person should feel **good** that he has learned a lot.

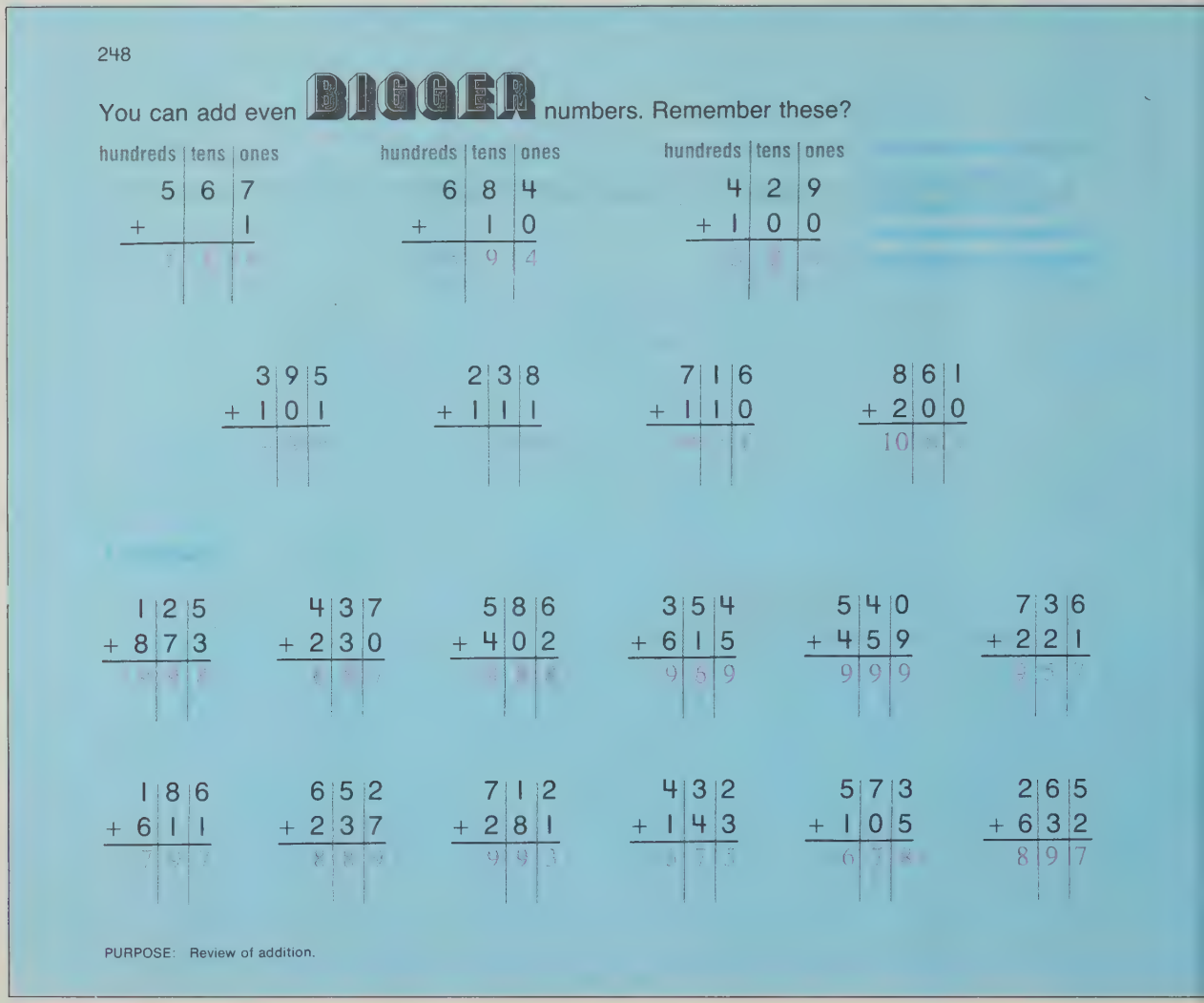
The page should be completed independently. Three skills are reviewed and checked:

- Addition facts
- Addition of two numbers, no renaming
- Addition of two 2-digit numbers with renaming

Examine any errors. What has the child forgotten? Provide practice in this prerequisite skill and then get those errors corrected. This is the time to praise those who do well and encourage those who still have problems.

goal Practice in adding 3-digit numbers, no renaming

page 248 Read the top line together. *Do you remember how to do these?* Have the youngsters complete the first two rows. Check results. Pupils who had trouble need your help rather than the work on this page. Review the steps listed at the right side before sending those who were successful on to complete the page. Anyone who makes an error should rework the problem. Addition facts with sums less than 10 are the major prerequisite skill involved.



248

You can add even BIGGER numbers. Remember these?

hundreds	tens	ones
5	6	7
+		1

hundreds	tens	ones
6	8	4
+	1	0
	9	4

hundreds	tens	ones
4	2	9
+ 1	0	0

3	9	5
+ 1	0	1

2	3	8
+ 1	1	1

7	1	6
+ 1	1	0

8	6	1
+ 2	0	0
10		

1	2	5
+ 8	7	3

4	3	7
+ 2	3	0

5	8	6
+ 4	0	2

3	5	4
+ 6	1	5
9	6	9

5	4	0
+ 4	5	9
9	9	9

7	3	6
+ 2	2	1

1	8	6
+ 6	1	1

6	5	2
+ 2	3	7

7	1	2
+ 2	8	1

4	3	2
+ 1	4	3

5	7	3
+ 1	0	5

2	6	5
+ 6	3	2
8	9	7

PURPOSE: Review of addition.

name _____

10 ones is 1 + 1 + 1 + 1 + 1 + 1 + 1 + 1 + 1 + 1 or 10
10 tens is 10 + 10 + 10 + 10 + 10 + 10 + 10 + 10 + 10 + 10 or 100
10 hundreds is 100 + 100 + 100 + 100 + 100 + 100 + 100 + 100 + 100 + 100

or That's a really big number.
What is its name?

You can add numbers that equal 1000.

500 + 500	400 + 600	800 + 200	700 + 300	900 + 100

You can add 1000s.

2000 + 3000	4000 + 3000	5000 + 1000	4000 + 4000	6000 + 3000

You can add these numbers, too.

1271 + 8405	2123 + 5700	4564 + 2205	2432 + 1465	3323 + 1564

© 1974, SRA PURPOSE: Extension of addition skills.

lesson Page 249

goal Extension of addition skills to thousands, no renaming

page 249 Read the top of the page together to introduce that big number 1000. *Imagine ten people in class each having 100 bottle caps. Then imagine all the bottle caps put into one box. You would have a lot of bottle caps! How many would you have?*

Take the rows of problems one at a time. Complete the first problem together. *How many ones? How many tens? How many hundreds?* Help with the recording and then have the answer read. *Try the next problem by yourself.* Check results. Pupils who are confident should complete the page independently. Monitor those answers if you can so that no one gets too far off the track.

lesson Page 250

goal Review and extension of subtraction skills

page 250 The first four rows review and check the subtraction skills developed in this level. Each skill is identified in the answer key. Not everyone will necessarily complete the page. Pupils who make no errors on the review are certainly ready to extend their skills with the problems in the bottom row. Rely on their background in place value—108 can be named as 10 tens 8 ones. No problem. The youngsters will simply be using what they have learned.

Remember what a good job you did with subtraction?
Skill: Basic subtraction facts

12 − 3 = 9	14 − 8 = 6	11 − 3 = 8	13 − 9 = 4	9 − 8 = 1

You can do these, too.
Skill: Subtracting multiples of ten

100 − 60 = 40	100 − 20 = 80	70 − 60 = 10	90 − 70 = 20	80 − 30 = 50

You showed you were good with these.
Skill: Subtraction with renaming

97 − 85 = 12	97 − 67 = 30	86 − 25 = 61	56 − 36 = 20	97 − 21 = 76

81 − 8 = 83	21 − 7 = 28	61 − 56 = 18	31 − 29 = 17	71 − 17 = 68

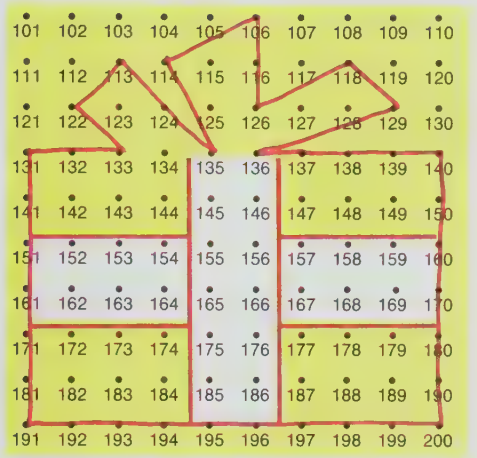
So you can do these, too.

108 − 73 = 35	159 − 98 = 61	116 − 56 = 60	139 − 76 = 63	117 − 95 = 22

PURPOSE: Review of subtraction.

name _____

To connect the dots, complete each row of problems below. Start at the dot having the same number as your first answer. Draw a line to the dot for your second answer. Keep going until you reach your last answer.



167 − 36 = 131	121 + 70 = 191	100 + 100 = 200
176 − 36 = 140	116 + 20 = 136	114 + 15 = 129
138 − 24 = 114	121 + 14 = 135	187 − 74 = 113

139 − 21 = 118	111 + 15 = 126	167 − 61 = 106
159 − 37 = 122	110 + 23 = 133	101 + 30 = 131

© 1974, SRA

PURPOSE: Fun with addition and subtraction.

lesson Page 251

goal Practice with addition and subtraction, no renaming

page 251 *Have you ever done a page like this before? What do you do?*

Will you have to be careful as you work the problems? What will you have to watch out for? Does it make a difference if you subtract for an addition problem?

When everyone has finished, talk about what could be in the box. Wouldn't it be nice if it were a piece of candy for every person in the room? (Hint)

lesson Pages 252, 253, 254

goal Readiness for multiplication

page 252 Treat this page as a game. Before the children open their books, explain that they will see a whole page full of pennies. The game will be to find out who is the fastest penny counter. The rules are to count the pennies and write the total on a piece of paper. As soon as they finish, they are to bring the paper to you. The first one with the correct answer will be declared the fastest penny counter.

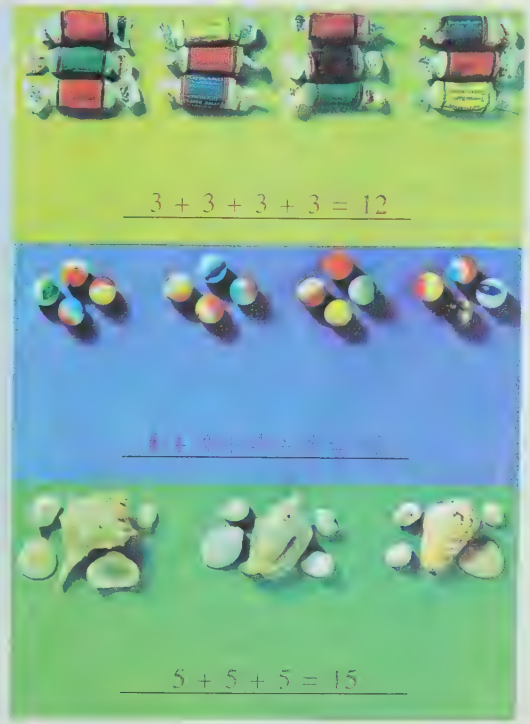
When the game is over talk about all the different ways the children counted. For example: 1, 2, 3, . . . or 10, 20, 30, . . . Decide what the fastest way of counting is.

Talk about the way the pennies are lined up. *Does this make it easier to count?* Listen for the words **row** and **column**. If the children don't use these words, ask how many pennies are in each **row**. Make sure you direct them to count across. *How many pennies in each* **column?** Direct them to count down. *Ten rows of 10 pennies. How many in all? Ten columns of 10 pennies. How many in all?*

name _____

Complete the sentence.

Write an addition sentence.



© 1974, SRA PURPOSE: Introduction to repeated addition.

goal Readiness for multiplication as repeated addition

page 253 Work the left half of the page together. *Look at the first problem. Ring sets of 3 pretzels. How many sets of pretzels? How many pretzels in one set? in two sets? in three sets?* Which children counted? Which ones used addition? Complete the sentence. Use the same approach with at least one more problem.

Then let the children work by themselves. When checking say, *Three plus three—how many is that? Six plus three more—how many in all?* Guide the children in this way for each problem.

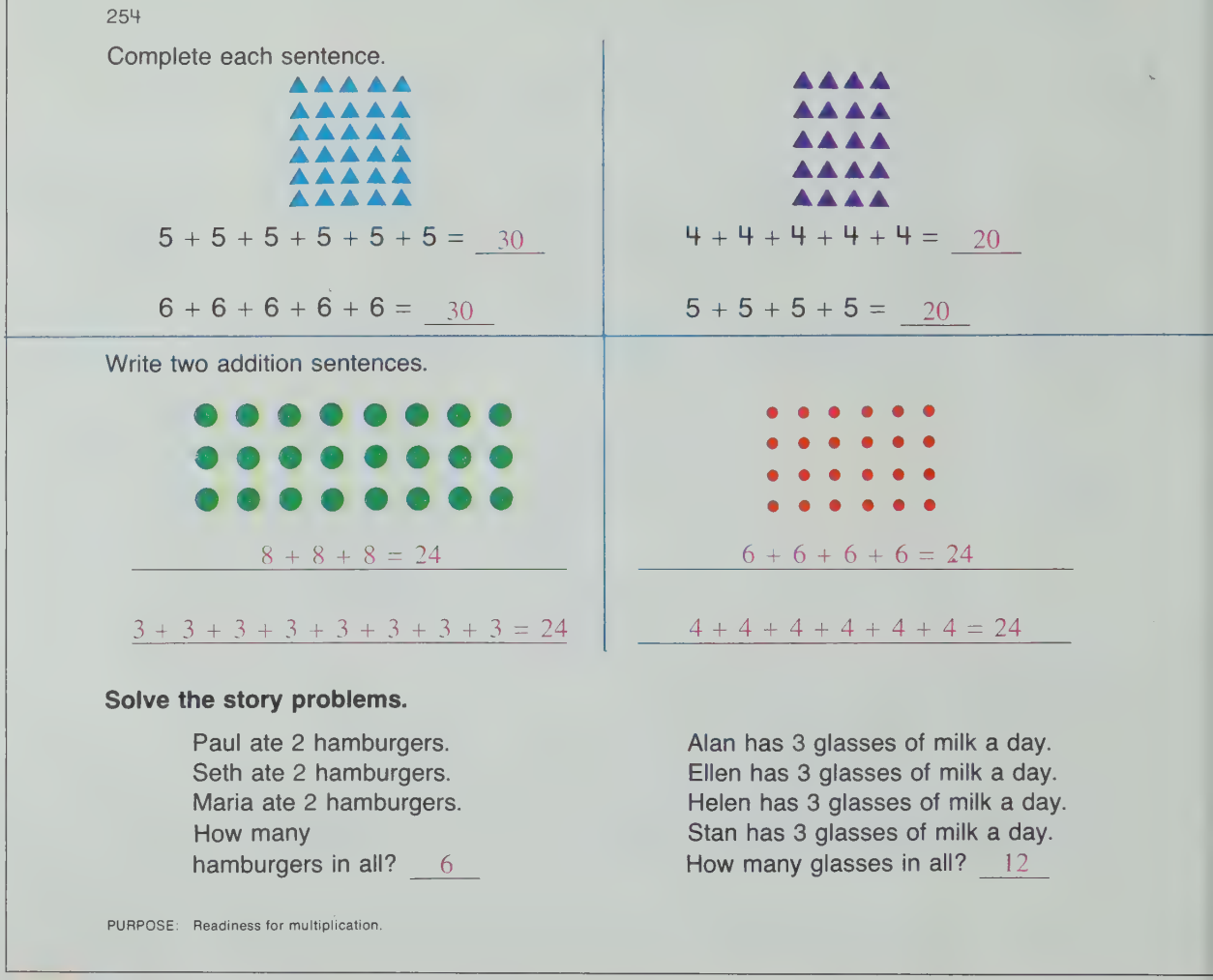
goal Readiness for multiplication as repeated addition and as shown by an ARRAY

warm-up Time for some oral counting practice. Review counting by 2s, 5s, and 10s. Count by 3s to 30 and by 4s to 40. Lead the counting with: 3 and 3 are? 6 and 3 more are? 9 and 3 more are? and so on. This will not be easy. Practice some more whenever you want to fill a spare minute.

page 254 Focus attention on the first array. *How many rows of triangles?* Make sure the children know that rows go across. *How many triangles in each row? Does every row have the same number of triangles?* Relate these questions to the first incomplete sentence. *How many in all?* Complete the sentence.

Look at the picture again. *How many columns?* Remind them that columns go up and down. *How many in each column? Does each column have the same number of triangles?* Relate these questions to the second incomplete sentence. *How many in all?* Add 6s and act amazed that the answers for the two sentences are the same.

There is a special name for this kind of picture. It is called an ARRAY. Write the word on the board. Talk about how an array can be identified—same number of objects in each row, same number of objects in each column. *Is there another array on this page? How do you know?* Guide the children through the remainder of the page, using the words **row, column,** and **array.**


254
Complete each sentence.
5 + 5 + 5 + 5 + 5 + 5 = 30
6 + 6 + 6 + 6 + 6 = 30
4 + 4 + 4 + 4 + 4 = 20
5 + 5 + 5 + 5 = 20
Write two addition sentences.
8 + 8 + 8 = 24
3 + 3 + 3 + 3 + 3 + 3 + 3 + 3 = 24
6 + 6 + 6 + 6 = 24
4 + 4 + 4 + 4 + 4 + 4 = 24
Solve the story problems.
Paul ate 2 hamburgers.
Seth ate 2 hamburgers.
Maria ate 2 hamburgers.
How many hamburgers in all? 6
Alan has 3 glasses of milk a day.
Ellen has 3 glasses of milk a day.
Helen has 3 glasses of milk a day.
Stan has 3 glasses of milk a day.
How many glasses in all? 12
PURPOSE: Readiness for multiplication.

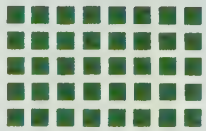
Everyone needs some paper. *Draw any array you want.* Discuss the results. Ask why each is (or is not) an array. Now have the children write two addition sentences for their arrays. Are the two sentences ever the same? When?

255

name _____

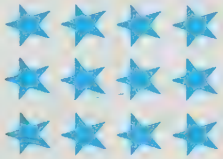
Fill in the blanks.

How many high? 5
How many wide? 8
How many in all? 40

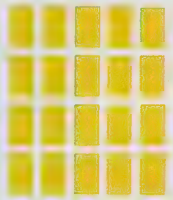


How many high? 6
How many wide? 3
How many in all? 18

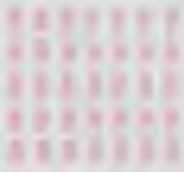
How many high? 3
How many wide? 4
How many in all? 12



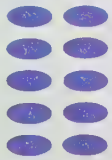
How many high? 4
How many wide? 5
How many in all? 20



How many high? 5
How many wide? 7
How many in all? 35



How many high? 5
How many wide? 2
How many in all? 10



© 1974, SRA PURPOSE: Readiness for multiplication.

things counters

Make an array that is 3 high and 4 wide. How many all together? Continue with other examples.

lesson Pages 255, 256

memo Continue the counting practice. It will really pay off later in multiplication.

warm-up Make a 3-by-4 array on the board. Also write the following rules:

high—number of rows
wide—number in each row

Have the children use the two rules written on the board to tell how high and how wide the array is. Leave these rules on the board for reference while working the page.

If you want to know how many objects are in the array, how could you count them? Stress the two ways an array can be counted—by rows or by columns. *Are the answers the same?*

page 255 Work the first problem together. Let everyone try the next one independently. Check how many in all by leading the oral counting. Count both by rows and by columns. Find out which pupils can go on by themselves. You will need to lead the others. Stress using counting to check how many in all.

goal Readiness for multiplication

page 256 You'll need to be in control every step of the way on this page. A table on a transparency or on the chalkboard will prove helpful as you explain. Read the line at the top of the page. Talk about how this table is different from any used so far. *Look at the green row of boxes at the top. What do you see?* (A row of dots in each box) *These show how many dots you will make in each row of an array.*

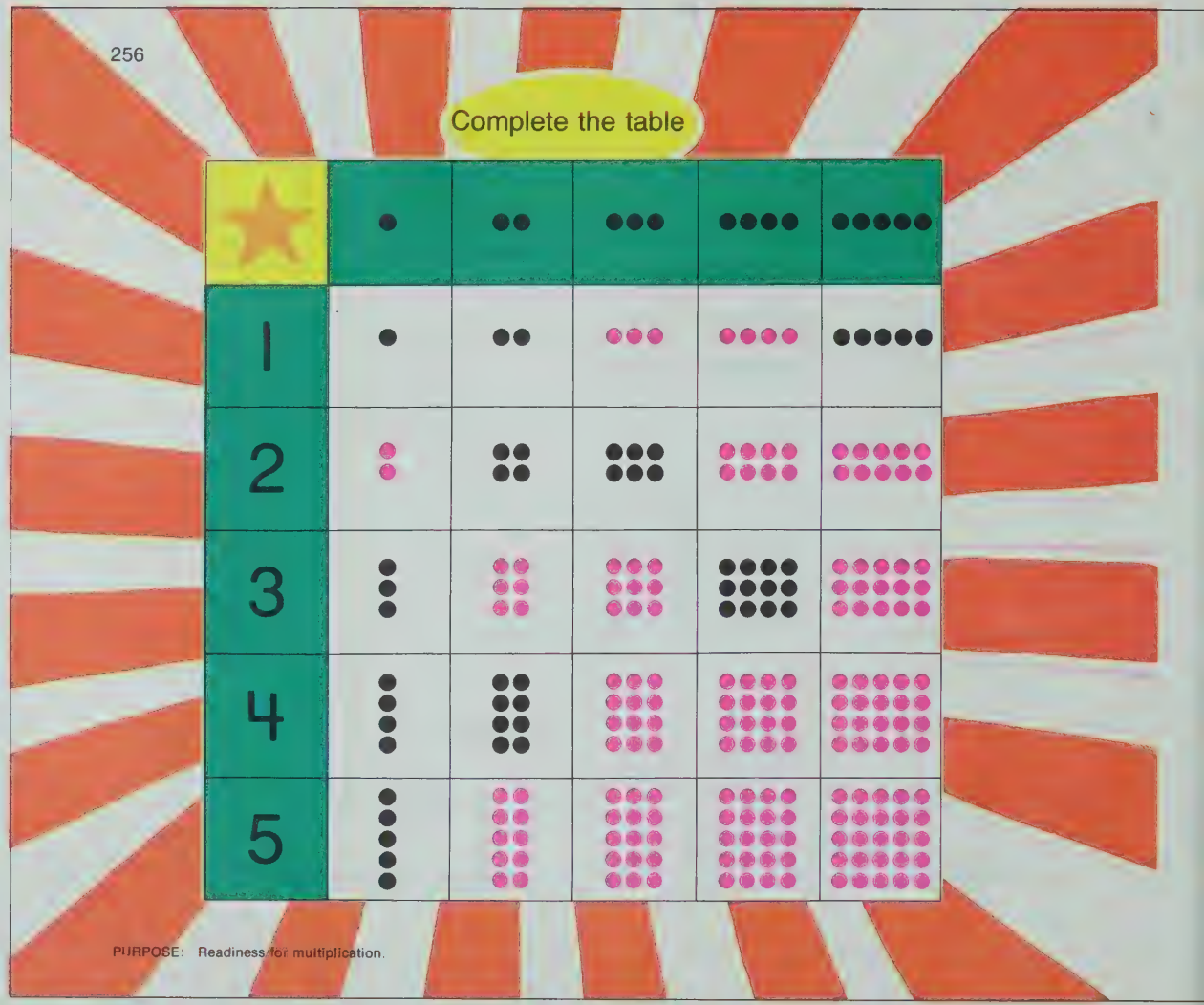
Look at the green column of boxes at the left side. What do you see in each box? (A number) *The number tells how many rows you will make in the array.*

Find the numeral 1. It tells us that each array going across this row of the table will have only one row.

The first box is already done. So is the next box. Why does it have only 1 row of 2 dots? What will you make in the next box? (1 row of 3 dots) *Make your array. How many dots will you make in the 1 row of the array for the next box?* (4) *Why is there 1 row of 5 in the last box?*

Find the numeral 2. How many rows in each array this time? (2) Continue leading your pupils with questions through the remainder of the table.

When the table is complete, find how many in each array by counting together. For example: 4 and 4? (8) 8 and 4? (12) 12 and 4? (16) 16 and 4? (20)



Form an array of children—standing or sitting. *First row, put your hands over your head. First column, touch your toes. Second row, stand on one foot.* Continue with other directions.

The end of the book. Wow! Doesn't everyone feel smart! Talk about all the things learned—adding and subtracting with renaming, measuring with centimetres and inches, telling time, fractions, and on and on. Was it all hard work or did they have fun too?

Math can be fun!

Some youngsters proved to be super mathematicians while others may not have mastered all the objectives for this level. Assure the latter that the next level's work will help them get that job done. If you have the time, it would be rewarding for you to talk to each child about his achievements. Give praise for those skills mastered and point out the learning goals yet to be reached. As you talk with each child, be reminded how important you were in helping your pupils reach their goals.

Congratulations for a job well done!

RESOURCES

additional learning aids

operation—chapter objectives 1, 2, 3, 4, 5, and 6

SRA products

Computapes, SRA (1972)
Module 1, Lessons: AS 7, 8, 17, 18, 19, 20
Module 2, Lesson: AS 21
Mathematics Involvement Program, SRA (1971)
Cards: 143, 124, 154
Skill through Patterns, level 2, SRA (1974)
Spirit masters: 23, 27, 40, 41, 42, 45, 46, 47
Visual Approach to Mathematics, level 2, SRA (1967)
Visual: 15

letter to parents

Dear Parents:

I want to sincerely thank you for your interest and cooperation this year. It is rewarding to look back over the year and at the same time do some planning for the future. Your child will not be able to tell you all the things he has learned this year, but he can share his progress record with you.

(Use pupil progress record duplicated from the Teacher's Guide, page 256g)

I hope that over the summer months your child will be able to use these skills, because the next level of mathematics will be built on this learning.

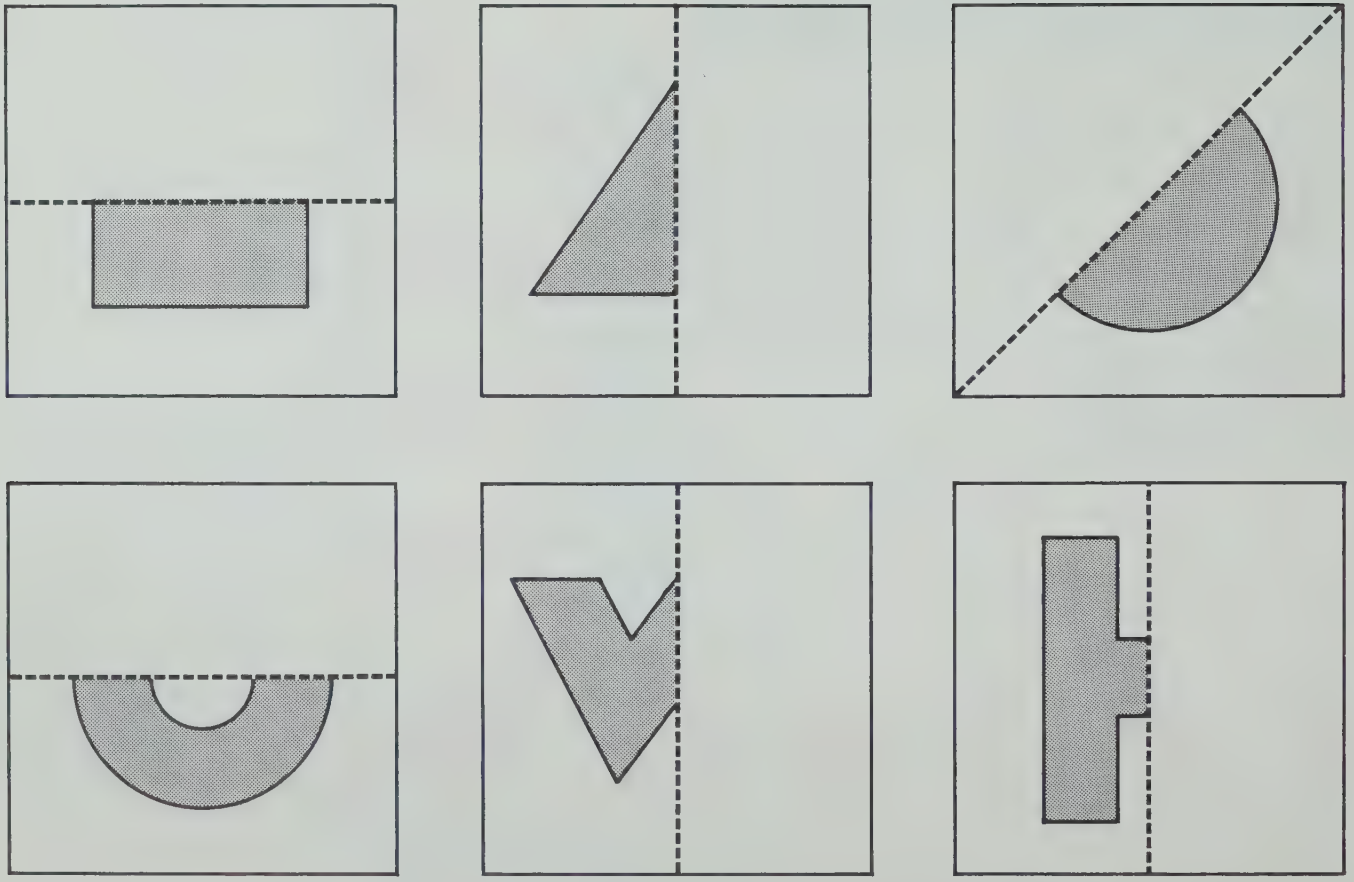
Groceries will have to be purchased, there will be games to play, the clock will tell what time to be home, buildings will be built in your community, and there may be a family vacation, too. All these activities are full of mathematics and opportunities for review.

It has been a good year. Thank you again.

Cut out each square. Fold on the dotted line.
Turn the paper so you can see the shaded part.
Cut out the shaded part. Don't cut the fold.

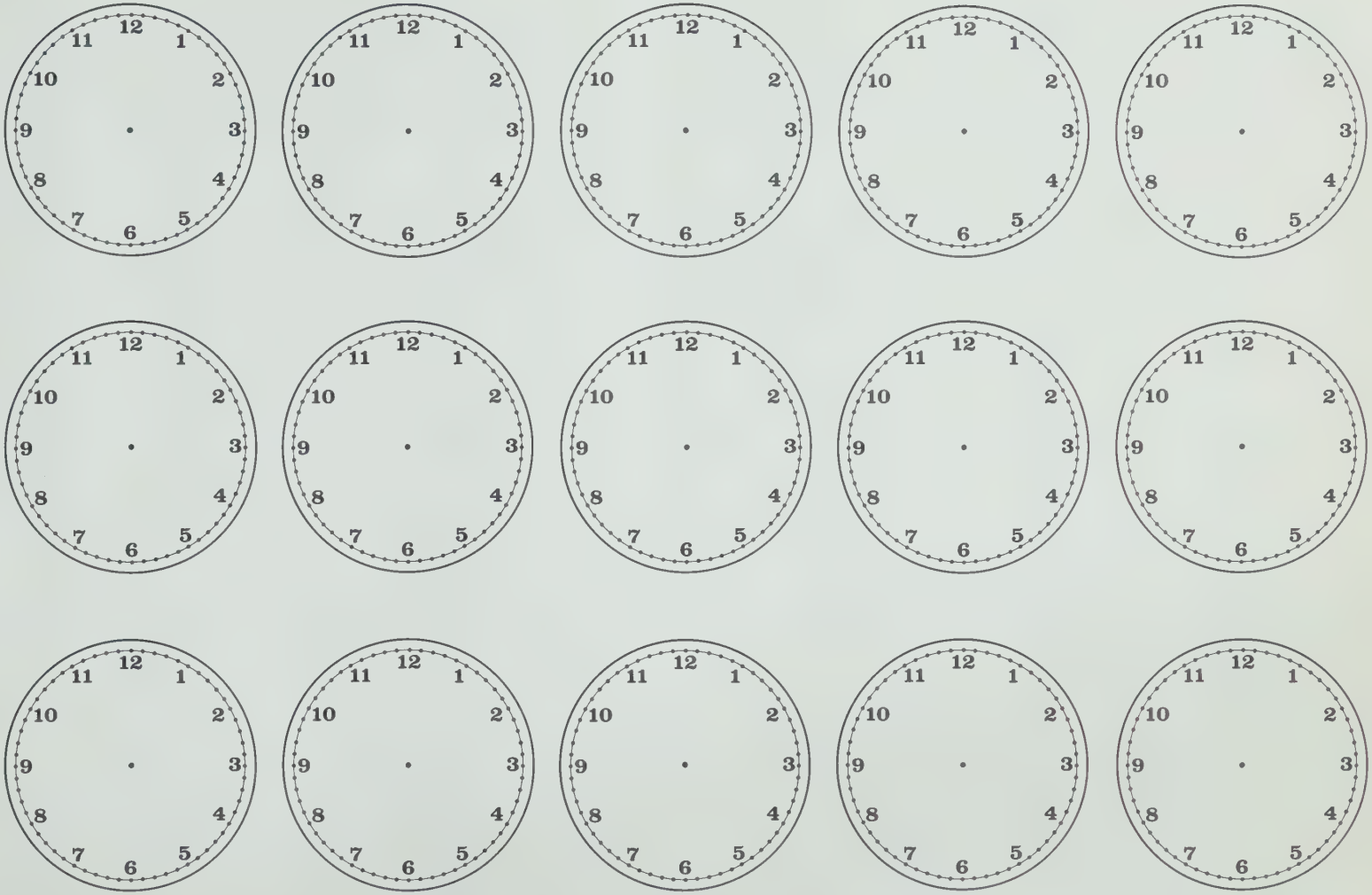
Guess what shape you have.

Now unfold the paper. Was your guess right?



© 1974, SRA Permission to reproduce for school use.

name _____



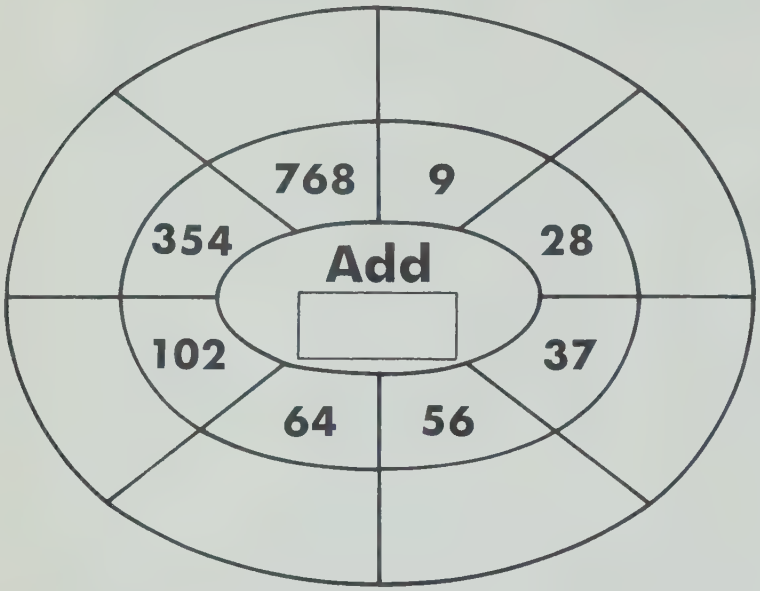
© 1974, SRA Permission to reproduce for school use.

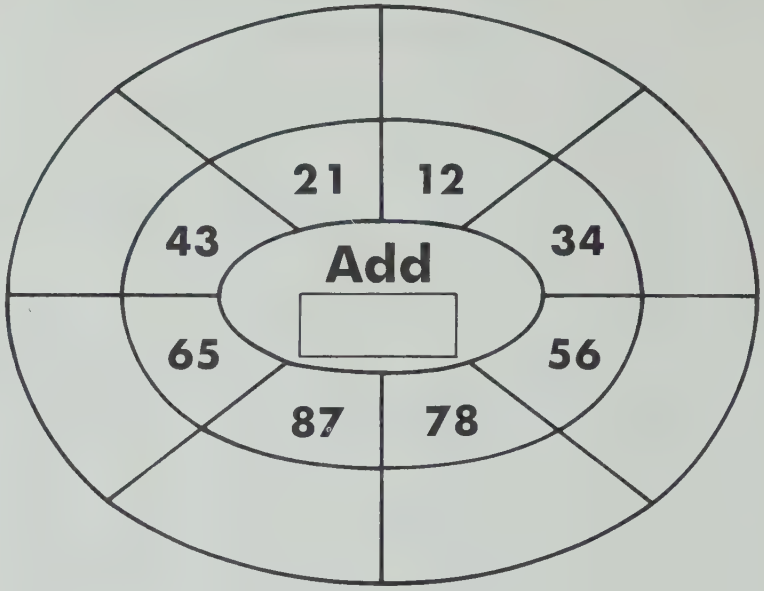
Permission to reproduce for school use.

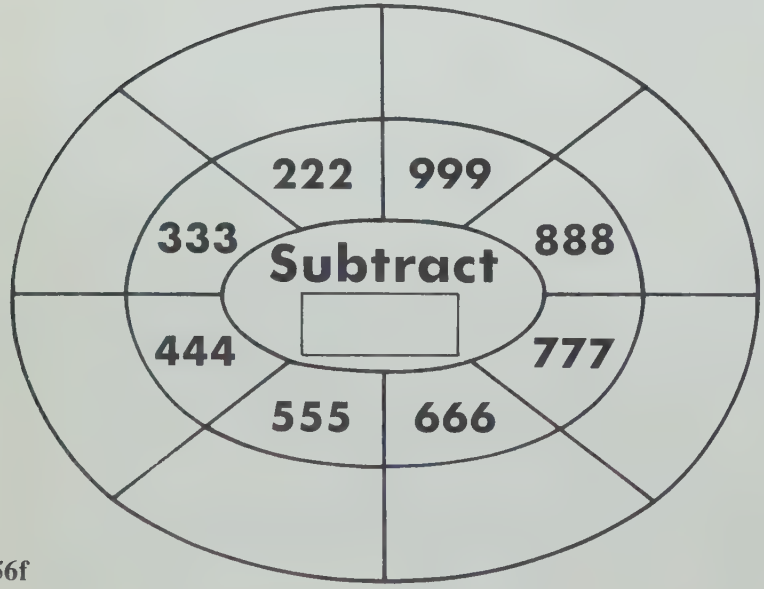
Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday

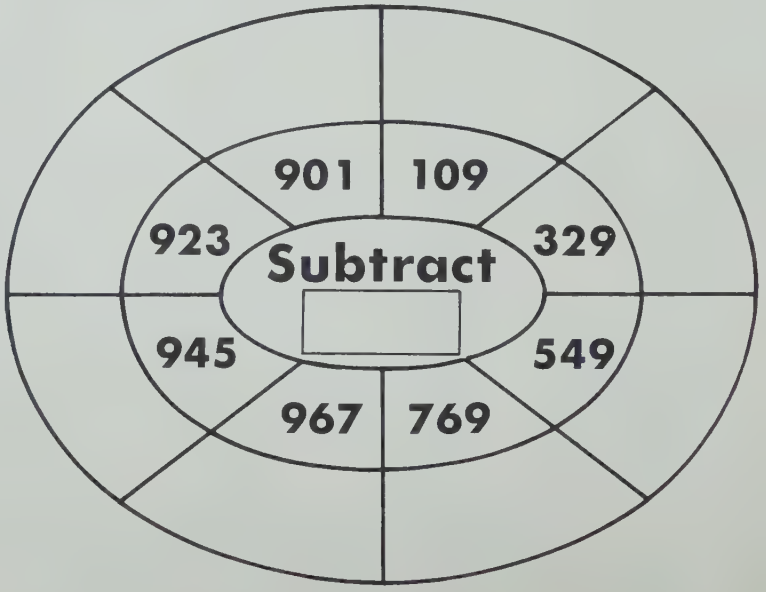
© 1974, SRA Permission to reproduce for school use.

Pick numbers less than 100. Put a different one in each box. Then go to work.



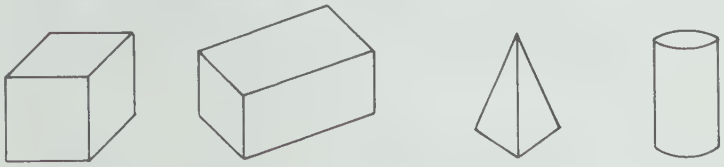






© 1974, SRA Permission to reproduce for school use.

my name _____ my teacher's name _____

	I can do it every time.	I will be able to do it soon.
I know how to count from 0 to 999.		
I know how to write the numbers from 0 to 999.		
I know which number is more than another number.		
I can say or write the numbers that come between two numbers.		
I can find the answer to any problem like these: $\begin{array}{r} 38 \\ +\ 6 \\ \hline \end{array}$ $\begin{array}{r} 43 \\ +\ 38 \\ \hline \end{array}$ $\begin{array}{r} 56 \\ +\ 27 \\ \hline \end{array}$ $\begin{array}{r} 16 \\ 14 \\ +\ 13 \\ \hline \end{array}$		
I know all the answers to problems like these: $\begin{array}{r} 8 \\ -\ 5 \\ \hline \end{array}$ $\begin{array}{r} 11 \\ -\ 7 \\ \hline \end{array}$ $\begin{array}{r} 16 \\ -\ 9 \\ \hline \end{array}$ $\begin{array}{r} 15 \\ -\ 6 \\ \hline \end{array}$		
I can find the answer to any problems like these: $\begin{array}{r} 82 \\ -\ 9 \\ \hline \end{array}$ $\begin{array}{r} 98 \\ -\ 34 \\ \hline \end{array}$ $\begin{array}{r} 60 \\ -\ 28 \\ \hline \end{array}$ $\begin{array}{r} 42 \\ -\ 14 \\ \hline \end{array}$		
I can show that the answer for pairs of problems like these is the same: $\begin{array}{r} 8 \\ +\ 5 \\ \hline \end{array}$ $\begin{array}{r} 5 \\ +\ 8 \\ \hline \end{array}$ $\begin{array}{r} 36 \\ +\ 25 \\ \hline \end{array}$ $\begin{array}{r} 25 \\ +\ 36 \\ \hline \end{array}$		
I can show that the way I group three numbers to add will not change the answer. $(5 + 4) + 3 =$ _____ $(5 + 3) + 4 =$ _____ $(3 + 4) + 5 =$ _____		
I can write a fraction to tell how much is shaded.		
I can find things shaped like these: 		
I can take a ruler and tell you how many centimetres or inches long my desk is.		
I can tell you when the clock says 4 o'clock or half past 7 o'clock or half past 10 o'clock.		
If you tell me a date, I can find it on a calendar.		
If you give me a dollar, a quarter, 2 dimes, a nickel, and 3 pennies, I can tell you how much money that is.		

© 1974, SRA Permission to reproduce for school use.

individual progress chart for _____
(pupil's name)

recorded by _____ **second-level teacher**

evaluation of learning goals	date of 1st try	date of 2d try	comments
Knows sums less than 10 (p. 13)			
Knows facts with sums 10–18 (p. 18)			
Knows the addition facts (p. 23)			
Knows the subtraction facts (p. 38)			
*Knows the easy addition and subtraction facts (p. 49)			
*Knows the hard addition and subtraction facts (p. 50)			
*Knows when to use the $>$, $<$, and $=$ symbols (p. 64)			
Knows how to add two 2-digit multiples of 10 (p. 75)			
Knows how to add 2- and 3-digit multiples of 10 (p. 86)			
Knows how to subtract 2- and 3-digit multiples of 10 (p. 91)			
*Knows how to add and subtract multiples of 10 (p. 92)			
*Knows shapes (T.G. p. 101)			
Knows how to add and subtract 2-digit numbers, no renaming (p. 111)			
*Knows place value related to addition and subtraction (p. 121)			
Knows changing the way three numbers are grouped for addition will not change the sum (p. 128)			
*Knows how to measure to the centimetre or inch (p. 144)			
Knows how to subtract 2-digit numbers, no renaming (p. 156)			
*Knows how to subtract 2-digit numbers, no renaming (p. 162)			
Knows how to add 2-digit numbers with renaming (p. 174)			
*Knows how to add two and three 2-digit numbers with renaming (p. 179)			
*Knows the value of a dollar and a set of coins (less than a dollar) (T.G. p. 192)			
Knows how to subtract a 1-digit number from a 2-digit number with renaming (p. 208)			
*Knows how to subtract two 2-digit numbers with renaming (p. 216)			
*Knows how to write a fraction to tell how much of a region is marked (p. 222)			
*Knows something about symmetry (p. 229)			
*Knows how to tell time to the half hour (p. 246)			

end of level checkout for mastery of addition and subtraction

Knows how to add 2-digit numbers with renaming (p. 247)			
Knows the subtraction facts (p. 250)			
Knows how to subtract 2-digit numbers with renaming (p. 250)			

*Checkout

© 1974, SRA Permission to reproduce for school use.

Other Learning Aids

whole-number concepts

Inset Shapes Board (set A) Sigma Scientific
Shapes that promote the concepts of bigger than, smaller than, ordering, and so on.

Keyboard Counter Creative Publications
Two sets of ten flip-up keys to illustrate groupings and sentences in addition and subtraction

100 Number Board Dick Blick
A marked grid board and 100 numbered plastic tablets for counting and ordering

whole-number notation

Chip Trading Creative Publications
Activities to develop understanding of place value and renaming through a variety of manipulative activities

Flip-A-Strip Place Value Chart Developmental Learning Materials
Large easel board with columns of strips for practice with place value and operations

Number-Blox Creative Publications
Physical models that present place value

whole-number operation

Abacus Board Creative Publications
Board with pegs for learning the concepts of addition and subtraction

Arithmetic Tube Ideal
Demonstrates sets of from 1 through 9 counters; addition and subtraction facts

Balance Scale
Available from several sources; sets up weight experiments, develops addition and subtraction, and reinforces renaming concept

Counting Blocks Ideal
Multicolored one-inch wood cubes

Counting Chips Creative Publications
Plastic disks of eight colors to use in counting and sorting activities and in work with place value and simple computation

Cuisenaire Rods Cuisenaire
Rods of proportioned sizes to model patterns and number relationships

Fundamath Ideal
Demonstration board to illustrate basic whole-number operations

Hainstock Blocks Creative Publications
Ten blocks, one for each numeral 0 through 9 corresponding to the Cuisenaire colors, to illustrate all addition combinations with a 1-digit sum

I Win (Sets 1 and 2) Scott, Foresman
Phrase cards to pair with answer cards for addition and subtraction practice

Make and Take Game Singer-SVE
A board game to provide practice with addition and subtraction facts

Match It Game Singer-SVE
A board game to provide practice in numeral recognition and number sequence

Mathfacts Games Milton Bradley
Practice with the basic number facts

Mini Veri-Tech ETA
A twelve-tile minicomputer and problem books in game form to provide self-corrective practice with the basic facts

Orbiting the Earth Scott, Foresman
(addition and subtraction)
Players toss numeral blocks and state basic facts correctly in order to move markers on a playing field

Quizmo (add-subtract) Milton Bradley
A lotto-type game for practice with addition and subtraction facts

Plus n' Minus Sigma Scientific
Self-testing device to reinforce basic addition and subtraction facts

Tally and Difference Math Shop
Games designed to provide practice with whole–number operations

fraction concepts

Fraction Circles Ideal
A set of six circles with one frame, divided into fractional parts

Fraction Squares Ideal
A set of six squares with one frame, divided into fractional parts

Visual Fraction Apparatus Mind/Matter
Twenty ridged-fractional parts that show equivalent fractions

geometry concepts

Color & Shape Bingo Sigma Scientific
A color-and-shape recognition game

Geoboard Activity Cards Creative Publications
Activity cards to help explore and compare geometric shapes and design

Geoboard Classroom Kit Cuisenaire
Individual boards and activity cards to help investigate geometric relationships

Soap-film Shapes SEE
Wire shapes that are dipped in soapsuds to make six different geometric-shaped bubbles

measurement concepts

Flannel Money Pieces Instructo
A piggy bank, items to be bought and sold, and coins to be used on a felt board

Judy Clock General Learning
Movable hands and visible functioning gears to provide telling time experiences

Judy Mini-Clocks General Learning
Miniatures of the Judy Clock for pupil use

Pay the Cashier Game Garrard
A board game centered on counting, adding, and subtracting money in a store situation

Trundle Wheel Creative Publications
A tool to measure distance in yards or metres

Willbrook Discovery Math Work Cards ETA
Activity cards involving applications of weight, length, time, and capacity concepts

Volume Relationships (set 1) Sigma Scientific
Volume relationships are demonstrated as liquid is poured from one model to another

Bibliography

the study of numbers

whole-number concepts

children's books

Baum, Arline and Joseph. *One Bright Monday Morning.* New York: Random House, 1962. (P–2)

Bennett, A.Y. *Picture Dictionary, ABCs, Telling Time, Counting Rhymes, Riddles and Finger Plays.* New York: Grosset & Dunlap, 1970. (P–1)

Children's Television Workshop, eds. *The Sesame Street Book of Numbers.* New York: New American Library, 1971. (P–1)

Ciardi, John. *I Met a Man.* Boston: Houghton Mifflin, 1961. (P–2)

Cranstoun, Margaret, illus. *One, Two, Buckle My Shoe.* New York: Holt, Rinehart & Winston, 1967. (P–1)

Crews, Donald. *Ten Black Dots.* New York: Scribner, 1968. (P–1)

Eichenberg, Fritz. *Dancing in the Moon: Counting Rhymes.* New York: Harcourt Brace Jovanovich, 1956. (P–2)

Fehr, Howard F. *Five is 5.* New York: Holt, Rinehart & Winston, 1963. (1–2)

———. *This Is My Family.* New York: Holt, Rinehart & Winston, 1963. (1–2)

Fisher, Margery M. *One and One.* New York: Dial, 1963. (P–1)

Françoise. *Jeanne-Marie Counts Her Sheep.* Scribner, 1957. (P–1)

Hall, William. *Captain Murphy's Tugboats.* New York: Holt, Rinehart & Winston, 1963. (1–2)

Hoban, Tana. *Count and See.* New York: Macmillan, 1972. (P–2)

Hogan, Carol G. *Eighteen Cousins.* New York: Parents' Magazine, 1968. (P–1)

Ipcar, Dahlov. *Brown Cow Farm.* Garden City, N.Y.: Doubleday, 1959. (1–2)

Langstaff, John, and **Rojankovsky, Feodor.** *Over in the Meadow.* New York: Harcourt Brace Jovanovich, 1967. (P–1)

McLeod, Emilie W. *One Snail and Me.* Boston: Little, Brown, 1961. (P–1)

Martin, Bill, Jr. *Ten Little Caterpillars.* New York: Holt, Rinehart & Winston, 1967. (P–1)

Morse, Samuel French. *Sea Sums.* Boston: Little, Brown, 1970. (P–1)

Nic Leodhas, Sorche. *All in the Morning Early.* New York: Holt, Rinehart & Winston, 1963. (P–2)

O'Brien, Thomas C. *Odds and Evens.* New York: Thomas Y. Crowell, 1971. (1–2)

Otto, Margaret. *Three Little Dachshunds.* New York: Holt, Rinehart & Winston, 1963. (1–2)

Quackenbush, Robert, illus. *Poems for Counting.* New York: Holt, Rinehart & Winston, 1963. (1–2)

Reiss, John J. *Numbers.* Scarsdale, N.Y.: Bradbury, 1971. (1–3)

Schott, Stella and **Andrew.** *Number Fun.* Northbrook, Ill.: Hubbard Press, 1967. (P–1)

Schuler, Ruby, and **Considine, Kate.** *One, Two, Three, Four.* New York: Holt, Rinehart & Winston, 1963. (1–2)

Sendak, Maurice. *One Was Johnnie: A Counting Book.* New York: Harper & Row, 1962. (P–1)

Slobodkin, Louis. *One Is Good but Two Are Better.* New York: Vanguard, 1956. (P–1)

Thayer, Jane. *Sandy and the Seventeen Balloons.* New York: Morrow, 1955. (P–1)

Tudor, Tasha. *1 Is One.* New York: Walck, 1956. (P–1)

Wagner, Ken. *From One to Ten and Back Again.* Racine, Wis.: Golden Press, 1972. (P–1)

Wildsmith, Brian. *Brian Wildsmith's One, Two, Threes.* New York: Watts, 1965. (P–1)

Withers, Carl. *Counting-out Rhymes.* New York: Dover, 1970. (P–1)

Yeoman, John, and **Blake, Quentin.** *Sixes and Sevens.* New York: Macmillan, 1971. (P–1)

Ziner, Feenie, and **Galdone, Paul.** *Counting Carnival.* New York: Coward, McCann & Geoghegan, 1962. (P–1)

films, filmstrips,* and slides

**Arithmetic for Beginners*, Series II: "The Circus," "Duck Eggs," "Roy's Number Friends," "The Tea Party." Color w/captions. Encyclopaedia Britannica Educational Corp. (P–2)

Birthday for Button. 16mm, sound, color. Universal Education & Visual Arts. (P–3)

**Bridging the Decades:* "Work and Play with Number 11," "Work and Play with Numbers 12 and 13," "Work and Play with Numbers 14 and 15," "Work and Play with Numbers 16 and 17," "Work and Play with Number 18," "Work and Play with Number 19," "Work and Play with Number 20." Color w/captions. Eye Gate House. (1–2)

**Developing Elementary Concepts:* "Order: First Always Comes before Last," "Quantity: Something Is Different from Nothing." Color w/records or cassettes. Eye Gate House. (P–3)

*_Exploring New Math:_ "Counting Numbers and Whole Numbers," "Introduction to Sets," "Mathematical Relationships," "Members of Sets," "More Sets." Color w/captions. Troll Associates. (P–3)

*_First Things: Mathematics:_ "Comparison: Putting a Symbol to Work," "More About Sets," "Number Patterns: Puzzles with a Purpose." Color w/records or cassettes. Guidance Associates. (P–3)

*_Kenner on Modern Mathematics_, Primary Kit: "Sets and Counting Numbers." Color w/captions. Filmstrip House. (P–3)

*_Mathematics for Children:_ "Sam, a Gerbil Tale." Color w/captions. Colonial. (P–2)

*_Mathematics for Primary Grades:_ "Matching Numbers," "The Meaning of Numbers One through Ten," "Story of Numbers." Color w/captions. Jam Handy. (P–2)

Old Woman in a Shoe. 16mm, sound, color. Coronet. (P–1)

*_Seeing the Use of Numbers_, Set I: "Count to Find Out," "The Numbers 1 to 5," "The Numbers 6 to 10," "The Numbers 11 to 19." Color w/captions. Eye Gate House. (P–2)

*_Seeing the Use Of Numbers_, Set II: "Counting to 20 by 1s, 2s, and 5s." Color w/captions. Eye Gate House. (1–2)

*_Work and Play with Numbers:_ "We Learn Numbers" (parts 1 and 2), "Work and Play with Numbers 5 and 6," "Work and Play with Numbers 7 and 8," "Work and Play with Numbers 8 and 9," "Work and Play with Numbers 9 and 10." Color w/captions. Eye Gate House. (1–2)

*_Young Math Series:_ "Odds and Evens." Color w/records or cassettes. Thomas Y. Crowell. (1–3)

whole-number notation

films, filmstrips,* and slides

*_Exploring New Math:_ "Number Line," "Place Value." Color w/captions. Troll Associates. (2–3)

*_Mathematics for Primary Grades:_ "Grouping Numbers." Color w/captions. Jam Handy. (2–3)

*_Seeing the Use of Numbers_, Set II: "Understanding Hundreds, Tens, and Ones." Color w/captions. Eye Gate House. (1–3)

whole-number operations

children's books

Whitney, David C. _Let's Find Out about Addition._ New York: Watts, 1966. (1–3)

_____. _Let's Find Out about Subtraction._ New York: Watts, 1968. (1–3)

films, filmstrips,* and slides

*_Exploring New Math:_ "Addition," "Addition and Subtraction," "Subtraction." Color w/captions. Troll Associates. (1–3)

Harbrace Mathematics Instructional Slides: "Addition and Subtraction of Whole Numbers." Cartridge of 140 slides, color w/captions. Harcourt Brace Jovanovich. (1–6)

*_Kenner on Modern Mathematics_, Primary Kit: "Extending Arithmetic," "Operations and Relations" (parts 1 and 2). Color w/captions. Filmstrip House. (2–3)

*_Mathematics for Children:_ "She Loves Blueberries" (addition and subtraction). Color w/captions. Colonial. (1–3)

*_Seeing the Use of Numbers_, Set I: "Groups of 2 to 10," "How Many Are Left?" "How Many in All?" "Putting Groups Together," "Taking a Group Apart." Set II: "Adding and Subtracting Two-Place Numbers," "Column Addition," "Sign Language," "Subtract to Find Out." Color w/captions. Eye Gate House. (1–3)

Ten Little Indians. 16mm, sound, color. Coronet. (1–2)

*_Work and Play with Numbers:_ "Addition and Subtraction Concepts," "Arithmetic Concepts." Color w/captions. Eye Gate House. (1–2)

whole-number applications

films, filmstrips,* and slides

*_Arithmetic for Beginners_, Series II: "The Storekeepers." Color w/captions. Encyclopaedia Britannica Educational Corp. (P–2)

*_Bridging the Decades:_ "Work and Play with Problems," "Work and Play with More Problems." Color w/captions. Eye Gate House. (1–2)

*_Seeing the Use of Numbers_, Set II: "Number Stories of 7 and 8," "Number Stories of 9 and 10," "Number Stories of 11 and 12," "Number Stories of 13 to 18." Color w/captions. Eye Gate House. (1–2)

fractional numbers

children's books

Dennis, J. Richard. *Fractions are Parts of Things.* New York: Thomas Y. Crowell, 1971. (1–2)

Walter, Marion. *Make a Bigger Puddle, Make a Smaller Worm.* New York: Evans, 1972. (P–1)

films, filmstrips,* and slides

**Exploring New Math:* "Fractions." Color w/captions. Troll Associates. (1–3)

**Fables of Numbers and Shapes:* "Tales from Fractionopolis." Color w/records or cassettes. Eye Gate House. (1–3)

Harbrace Mathematics Instructional Slides: "Rational Numbers." Cartridge of 140 slides, color w/captions. Harcourt Brace Jovanovich. (1–6)

**Kenner on Modern Mathematics*, Primary Kit: "Discovering Fractions." Color w/captions. Filmstrip House. (1–3)

**Mathematics for Children:* "The Magic Garden" (fractions). Color w/captions. Colonial. (P–2)

**Mathematics for Primary Grades:* "What One Half Means." Color w/captions. Jam Handy. (P–2)

Meaning of Fractions. 16mm, sound, color. John Colburn Assoc. (1–3)

Primary Math Series: "One-fourth," "One-half," "One-third." Super-8mm film loops, color. BFA Educational Media. (1–3)

the study of geometry

children's books

Berenstain, Stanley and **Janice.** *Inside, Outside, Upside Down.* New York: Random House, 1968. (P–1)

Miller, Albert G. *The Pop-up Color Book with Magic Color Wheels.* New York: Random House, 1968. (P–1)

Oechsli, Kelly, illus. *Surprise! Surprise!* New York: Holt, Rinehart & Winston, 1967. (P–1)

Podendorf, Illa. *Shapes: Sides, Curves, and Corners.* Chicago: Childrens Press, 1970. (1–3)

Schlein, Miriam. *Shapes.* Reading, Mass.: William R. Scott (Addison-Wesley), 1952. (1–2)

Sitomer, Mindel and **Harry.** *Circles.* New York: Thomas Y. Crowell, 1971. (P–1)

_____. *What Is Symmetry?* New York: Thomas Y. Crowell, 1972. (1–4)

Sullivan, Joan. *Round Is a Pancake.* New York: Holt, Rinehart & Winston, 1963. (1–2)

Supraner, Robyn. *Draw Me a Circle.* New York: Simon & Schuster, 1970. (P–1)

_____. *Draw Me a Triangle.* New York: Simon & Schuster, 1970. (P–1)

Thayer, Jane. *Andy's Square Blue Animal.* New York: Morrow, 1962. (P–1)

Walter, Marion. *Look at Annette.* New York: Evans, 1972. (1–3)

Weigle, Oscar. *Color and Shapes.* New York: Grosset & Dunlap, 1972. (P–1)

films, filmstrips,* and slides

**Developing Elementary Concepts:* "Direction: Can You Somersault Sideways?" "Location: Over and Under and In Between," "Shape: A Circle Is Never Square." Color w/records or cassettes. Eye Gate House. (P–3)

**Fables of Numbers and Shapes:* "The Babble-Yaks," "Bobby Blob Visits Shapeland," "The Grabannas," "The Spotted Forest," "Yogurt the Ogre (and Stuff)." Color w/records or cassettes. Eye Gate House. (P–3)

Harbrace Mathematics Instructional Slides: "Geometry, Measurement, and Graphing." Cartridge of 140 slides, color w/captions. Harcourt Brace Jovanovich. (1–6)

**We Use Mathematics:* "Geometric Shapes." Color w/captions. Universal Education & Visual Arts. (1–3)

**Young Math Series:* "What Is Symmetry?" Color w/records or cassettes. Thomas Y. Crowell. (1–3)

the study of measurement

children's books

Bendick, Jeanne. *The First Book of Time.* New York: Watts, 1963. (1–2)

_____. *How Much and How Many: The Story of Weights and Measures.* New York: McGraw-Hill, 1947. (1–3)

Berenberg, Ben R. *Clock Book,* rev. ed. Racine, Wis.: Golden Press, 1967. (1–2)

Brenner, Barbara. *The Five Pennies.* New York: Knopf, 1963. (P–1)

Epstein, Sam and **Beryl.** *The First Book of Measurement.* New York: Watts, 1960. (1–3)

Fey, James T. *Long, Short, High, Low, Thin, Wide.* New York: Thomas Y. Crowell, 1971. (P–2)

Françoise. *What Time Is It, Jeanne-Marie?* New York: Scribner, 1963. (1–2)

Friskey, Margaret, ed. *About Measurement.* Chicago: Melmont, 1965. (1–3)
Froman, Robert. *Bigger and Smaller.* New York: Thomas Y. Crowell, 1971. (P–1)
Keyser, Sarah. *Up, Down, All Around.* Bronx, N.Y.: Platt & Munk, 1971. (P–1)
Klein, Lenore. *What Is an Inch?* New York: Harvey House, 1966. (1–2)
Le Sieg, Theo. *Ten Apples Up on Top.* New York: Random House, 1961. (P–1)
Oechsli, Kelly, illus. *It's Schooltime.* New York: Holt, Rinehart & Winston, 1967. (P–1)
Shulevitz, Uri. *One Monday Morning.* New York: Scribner, 1967. (1–2)
Srivastava, Jane Jonas. *Weighing and Balancing.* New York: Thomas Y. Crowell, 1972. (1–4)
Tudor, Tasha. *Around the Year.* New York: Walck, 1957. (1–3)
Ward, Lynd. *The Biggest Bear.* Boston: Houghton Mifflin, 1952. (P–1)
Wing, Henry Ritchet. *Ten Pennies for Candy.* New York: Holt, Rinehart & Winston, 1963. (1–2)
_____. *What Is Big?* New York: Holt, Rinehart & Winston, 1963. (1–2)
Wittram, H. R. *Going Up, Going Down.* New York: Holt, Rinehart & Winston, 1963. (1–2)

films, filmstrips,* and slides

Button's Tall Tower. 16mm, sound, color. Universal Education & Visual Arts. (1–3)
**Developing Elementary Concepts:* "Smaller than Large and Larger than Small." Color w/records or cassettes. Eye Gate House. (P–3)
**First Things: Mathematics:* "How to Say How Much." Color w/records or cassettes. Guidance Associates. (P–3)
Harbrace Mathematics Instructional Slides: "Geometry, Measurement, and Graphing." Cartridge of 140 slides, color w/captions. Harcourt Brace Jovanovich. (1–6)
How Little, How Big. 16mm, sound, color. Encyclopaedia Britannica Educational Corp. (P–1)
**Kenner on Modern Mathematics,* Primary Kit: "Understanding Units of Measurement." Color w/captions. Filmstrip House. (1–3)
Let's Measure: Inches, Feet, and Yards. 16mm, sound, b&w. Coronet. (1–2)
Let's Measure: Pints, Quarts, and Gallons. 16mm, sound, b&w. Coronet. (1–2)
**Mathematics for Children:* "Measure Me." Color w/captions. Colonial. (P–2)
**Mathematics for Primary Grades:* "Comparing Sizes," "Measuring How Long," "Measuring How Much." Color w/captions. Jam Handy. (P–2)
**Measuring Things:* "Measuring Length," "Measuring Liquid," "Measuring Time with a Calendar," "Measuring Time with a Clock," "Measuring Weight," "Using Standard Units." Color w/records or cassettes. Coronet. (1–2)
**Seeing the Use of Numbers,* Set I: "Time and Money," "Vocabulary 1." Color w/captions. Eye Gate House. (P–2)
Time for Clocks. 16mm, sound, color. Encyclopaedia Britannica Educational Corp. (1–2)
**We Use Mathematics:* "English System of Measurement," "Liquid Measure," "Measurement," "The Metric System," "Money," "Time," "Time in Minutes." Color w/captions. Universal Educational & Visual Arts. (1–3)
**Work and Play with Numbers:* "Time and Money." Color w/captions. Eye Gate House. (1–2)
**Young Math Series:* "Bigger and Smaller," "Weighing and Balancing." Color w/records or cassettes. Thomas Y. Crowell. (1–3)

other concepts that flow through the program

children's book

Linn, Charles F. *Estimation.* New York: Thomas Y. Crowell, 1972. (1–4)

films, filmstrips,* and slides

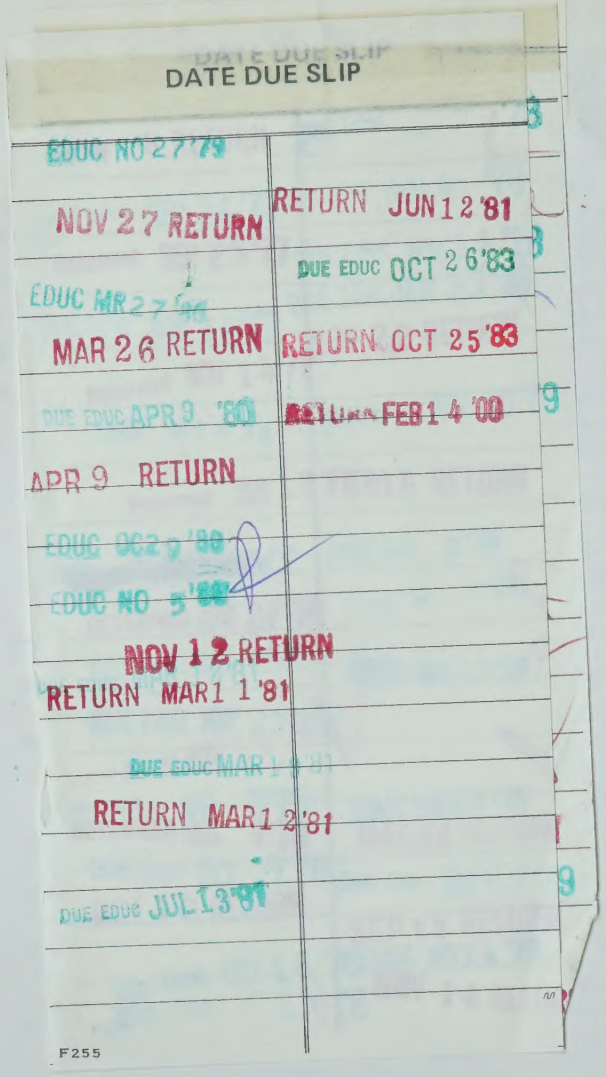
**Young Math Series:* "Estimation." Color w/records or cassettes. Thomas Y. Crowell. (1–3)

ACKNOWLEDGMENTS
Design and Production:
Design Counsel, Inc.

Photographs:
xiii, 50e, 92c, 101c, 144c, 163c, 179c, 192c, 229c, 246c: Photographs by Monkmeyer.
64c: Photograph by George W. Gardner.
216c: Photograph by Magnum.
128j: The Laboratory Approach to Mathematics, © 1970, SRA.

QA 107 S42 1974 LEV-2 TCH-GD-
BK-2
SCIENCE RESEARCH ASSOCIATES
SRA MATHEMATICS LEARNING
39185871 CURR

000020890430



TABLES OF MEASURE

	CUSTOMARY	METRIC
LENGTH	12 inches (in.) = 1 foot 3 feet (ft.) = 1 yard 1760 yards (yd.) = 1 mile	10 millimetres (mm) = 1 centimetre 10 centimetres (cm) = 1 decimetre 10 decimetres (dm) = 1 metre 10 metres (m) = 1 dekametre 10 dekametres (dkm) = 1 hectometre 10 hectometres (hm) = 1 kilometre (km)
AREA	144 square inches (sq. in.) = 1 square foot 9 square feet (sq. ft.) = 1 square yard 4840 square yards (sq. yd.) = 1 acre 640 acres = 1 square mile 1 square mile (sq. mi.) = 1 section (of land) 36 sections = 1 township	100 square millimetres (sq. mm) = 1 square centimetre 10,000 square centimetres (sq. cm) = 1 square metre 100 square metres (sq. m) = 1 are 100 square ares (a) = 1 hectare 100 hectares (ha) = 1 square kilometre
WEIGHT	16 drams (dr.) = 1 ounce 16 ounces (oz.) = 1 pound 2000 pounds (lb.) = 1 ton (tn.)	10 milligrams (mg) = 10 centigrams (cg) = 10 decigrams (dg) = 10 grams (g) 10 dekagrams (dkg) 10 hectograms (hg) 1000 kilograms (kg)
VOLUME	1728 cubic inches (cu. in.) = 1 cubic foot 27 cubic feet (cu. ft.) = 1 cubic yard (cu. yd.)	1000 cubic millimet 1000 cubic centime 1000 cubic decimet
CAPACITY	**Liquid** 2 cups (c.) = 1 pint 2 pints (pt.) = 1 quart 4 quarts (qt.) = 1 gallon (gal.) **Dry** 2 pints (pt.) = 1 quart 8 quarts (qt.) = 1 peck 4 pecks (pk.) = 1 bushel (bu.)	**Liquid and Dry** 10 millilitres (ml) 10 centilitres (cl) 10 decilitres (dl) 10 litres (l) 10 dekalitres (dkl) 10 hectolitres (hl)

QA 107 S42 1974 Lev.2 Tch. gd.
Bk.2
Science Research Associates.
SRA Mathematics learning
00873251 CURR
U OF A.

2468854

B16498

M. Vere DeVault
Helen Frehmeyer
Herbert J. Greenberg
Stanley J. Bezuszka

Reorder no. 3-04
ISBN 0-674-43